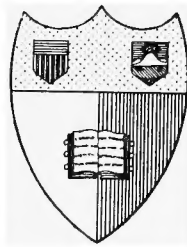


THE
INDUSTRIAL EDUCATION
SURVEY
OF THE CITY OF NEW YORK



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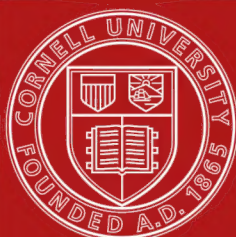
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THE INDUSTRIAL EDUCATION
SURVEY OF THE CITY OF
NEW YORK

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THE INDUSTRIAL EDUCATION SURVEY OF THE CITY OF NEW YORK

Complete Report of the Committee Authorized by the Board of
Estimate and Apportionment

- I. THE PRINTING TRADE
 - II. INSIDE ELECTRICAL WORK
 - III. CARPENTRY AND JOINERY
 - IV. THE MACHINIST TRADE
 - V. INDUSTRIAL CLASSES IN
THE PUBLIC SCHOOLS
-

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TABLE OF CONTENTS

FOREWORD	7
----------------	---

PART I

THE PRINTING TRADE

DEVELOPMENT OF THE INDUSTRY.....	15
Importance of the Printing Industry.....	17
Types of Printing Establishments.....	19
Recent Developments in the Printing Trade.....	21
Centralization of the Printing Industry.....	21
Number of Compositors and Pressmen in New York City.....	22
Nationality of Workers.....	24
Where the Workers Are Trained.....	24
The Transient Printer.....	25
Fluctuation of Employment.....	26
Night Workers	26
Trade Organizations	27
THE COMPOSING ROOM.....	31
Evolution from Hand Setting to Machine Composition.....	31
The "Non-Distribution" System.....	32
Union Scale of Wages for Commercial Shop Composing Rooms.....	35
Union Scale of Wages for Daily Newspaper Composing Rooms.....	35
Apprentice Training in the Composing Room.....	36
Women in Composing Rooms.....	42
Circuit Machinists	43
Sub-Divisions of Composing Room Work.....	44
Handman	44
Linotype and Intertype Operators.....	46
Linotype and Intertype Machinists.....	46
Monotype Operators	47
Monotype Machinist	48
Machinist Operators	49
Make-up Man	49
Proofreader	49
Stonehand	50
Copyholder	50
Copycutter	51
Bankman	51
Foreman and Superintendent.....	51
THE PRESSROOM	53
Mechanical Development in the Pressroom.....	53
Methods of Printing.....	55
Employment	56
How Pressroom Workers Are Trained.....	57
Weekly Wages of Commercial and Newspaper Pressroom Workers....	61
Newspaper Pressrooms	62
Cylinder Pressman	63
Cylinder Feeder	67
Magazine and Book-Web Pressman.....	69
Assistant on Magazine or Book-Web Press.....	71
Rotogravure Pressman	72
Assistant Rotogravure Pressman.....	73
Offset Pressman	73
Assistant Offset Pressman.....	74
Job Pressman	75

Job Press Feeders.....	76
Newspaper Pressman in Charge.....	77
Pressman on Newspaper Press.....	79
Flyboy on Newspaper Press.....	80
SUMMARY OF THE TRADE STUDY.....	81
OUTSIDE AGENCIES FOR THE TRAINING OF PRINTERS.....	82
Schools Established by the Board of Education.....	82
Day Trade Preparatory Courses in Printing.....	82
Public Evening School Courses in Printing.....	84
Harlem Evening Trade School	
Murray Hill Evening Trade School	
Stuyvesant Evening Trade School	
Brooklyn Evening Trade School	
Elementary Evening School No. 95	
Schools Maintained Under Private Auspices.....	87
School for Printers' Apprentices	87
Newspaper Pressmen's School.....	88
Employing Printers' School.....	88
West Side Y. M. C. A. School.....	89
Pressmen's Correspondence Courses.....	89
I. T. U. Correspondence Courses.....	90
Baron de Hirsch Trade School.....	90
New York Trade School.....	91
Other Schools	91
RESOLUTIONS ADOPTED BY	
Conference Committees	92
Employers' Committees	92
Union Committee	95
Endorsement of International President.....	98
Endorsement of Officer of Newspaper Publishers' Association.....	99
REPORT OF ADVISORY COMMITTEE.....	100

PART II

INSIDE ELECTRICAL WORK

INSIDE ELECTRICAL WORK.....	105
Brief History of the Electrical Industries.....	105
Outline of the Development of Wiring.....	105
Definition of Inside Electric Wiring.....	106
Importance of the Trade.....	107
Nationality of Workers.....	108
Types of Electrical Contracting Establishments.....	108
Specialization	109
How Inside Electric Workers are Trained.....	109
Scale of Wages.....	111
Regularity of Employment.....	111
Licenses for Contractors and Electricians.....	112
Trade Organizations	113
Employers' Associations.....	113
Employees' Associations.....	114
Traveling Cards.....	115
Analysis of the Trade.....	116
Steel Armored Conductor Work.....	116
Conduit Work.....	118
Flexible Conduit Work.....	120
Circuit and Feeder Pulling.....	121
Circuit Wires.....	121
Feed Wire Pulling.....	121
Metal Molding.....	123
Open Work Wiring (Knob and Cleat Work).....	124
Setting and Connecting Switches and Receptacles.....	124
Installing Panel Boards.....	125
Testing and Connecting Circuit Wires.....	125
Fixture Hanging.....	126
Bell Signal Wiring.....	126
Temporary Light and Power Installations for Building Operations.....	127
Decorative Light Wiring.....	129
Electrical Signs and Flashers.....	130
Power Plant Installations.....	131

Elevator Signals (The Up and Down System).....	135
Elevator Control	137
Marine Installation.....	140
Knowledge Required by Workers in All Branches.....	141
Mathematics	142
Drawing	142
Electrical Theory.....	142
Skill Required for All Workers.....	143
Summary of the Trade Study.....	143
OUTSIDE AGENCIES FOR THE TRAINING OF ELECTRICIANS.....	145
Schools Established by the Board of Education.....	145
Day Vocational Schools.....	145
Boys' Vocational School.....	145
Murray Hill Vocational School.....	146
Brooklyn Vocational School.....	147
Evening Trade Schools.....	147
Occupations of Men Attending Electric Wiring Classes.....	148
Schools Under Private Auspices.....	149
RECOMMENDATIONS OF THE TRADE COMMITTEES.....	151
REPORT OF ADVISORY COMMITTEES	153

PART III CARPENTRY AND JOINERY

THE CARPENTRY AND JOINERY TRADE.....	155
Importance of the Trade.....	156
How Workers are Obtained.....	156
Supply and Demand.....	156
Apprentices	157
Nationality and Ages of Workers.....	159
Nationality	159
Ages	160
Regularity and Conditions of Employment.....	160
Seasonal Fluctuations'	160
Rush Jobs.....	161
Specialization	162
Lack of Material.....	162
Scale of Wages.....	162
Organizations	164
Employers' Organizations.....	164
Employees' Organizations.....	164
Methods of Contracting.....	166
The General Contractor.....	166
The Percentage Contractor.....	167
The Sub-Contractor.....	167
The Lumper.....	167
Analysis of the Trade.....	168
Mill and Shop Work.....	169
The Mill Superintendent.....	169
Outside Man.....	170
The Shop Detailer.....	171
Bench Hands and Special Workers.....	172
Foreman of Bench Hands.....	172
The Dry Kiln Attendant.....	173
The Shop Laborer and Machine Helper.....	174
The Glue Hand.....	174
The Sander.....	174
The Bench Hand Cabinet Maker.....	175
The Bench Hand Specialist.....	177
The Bench Hand Wood Stair Builder.....	177
Machine Operators.....	178
The Foreman of Machine Hands.....	179
The Stock Cutter.....	180
The Rip Saw Operator.....	181
The Jointer and Planer Operator.....	181
The Surface Operator.....	182
The Saw Bench Operator.....	182
The Band Saw Operator.....	182
The Moulder-Sticker Operator.....	183
The Shaper Operator.....	183

The Tenoning Machine Operator.....	184
The Operator on Special Machines.....	184
The Shop Millwright, Repairman and Sharpener.....	185
Significance of the Occupation.....	185
Significance of the Machine Division Other than the Stock Cutter.....	185
Erection Work.....	186
The Job Superintendent.....	187
The Foreman on Wood Trim.....	188
The Foreman on Metal Trim.....	189
The Foreman Joiner on Frame House Construction.....	189
The Foreman Framers.....	190
The Concrete Form Foreman.....	191
The Foremen—Erection Work.....	191
The Trim Joiner on Private Houses and Work of the Better Class.....	192
The Trim Joiner on Work of the Cheaper Class.....	193
The Carpenter and Joiner on Frame Houses of the Better Class.....	194
The Carpenter-Joiner on Frame Houses of the Cheaper or Specu- lative Class.....	196
The Wood Stair Builder on Houses of the Better Class.....	197
The Wood Stair Builder on Speculative Work.....	197
The Metal Trim Erector and Bronze Worker.....	198
The Metal Trim Joiner.....	199
The Journeyman Framers.....	199
The Floor Layer.....	200
The Parquet Floor Layer.....	201
The Fixture Assembler.....	202
The Jobbing and Alteration Carpenter.....	204
The Concrete Form Joiner.....	205
The Concrete Form Stripper.....	207
Summary of the Trade Findings.....	207
OUTSIDE AGENCIES FOR THE TRAINING OF CARPENTERS AND JOINERS.....	210
Classes Established by the Board of Education.....	210
Day School Courses.....	210
Evening Trade School Courses.....	211
Murray Hill Evening Trade School.....	211
Harlem Evening Trade School.....	212
Brooklyn Evening Trade School.....	212
Long Island Evening Trade School.....	212
Stuyvesant Evening Trade School.....	212
Bushwick Evening Trade School.....	213
Tottenville Evening Trade School.....	213
Courses Maintained Under Private Auspices.....	214
Pratt Institute.....	214
The Baron de Hirsch Trade School.....	214
The New York Trade School.....	214
RECOMMENDATIONS OF TRADE COMMITTEES.....	215
REPORT OF ADVISORY COMMITTEE.....	217

PART IV

THE MACHINIST TRADE

THE MACHINIST TRADE.....	219
Historical Sketch.....	219
Local Landmarks.....	222
Importance of the Trade.....	224
Numbers Engaged in Trade.....	225
Nationality of Workers.....	225
How Machinists are Trained.....	225
Regularity of Employment.....	227
Scale of Wages.....	228
Union.....	228
Machinists.....	228
Specialists.....	228
Helpers.....	228
Apprentices.....	229
Non-union.....	229
Types of Machine Shops.....	229
Specialization.....	233
Trade Organizations.....	234
Employers' Associations.....	234
Employees' Organizations.....	234
Analysis of the Trade.....	235

Requirements for the Machinist.....	236
Laying Out Work.....	238
Assembler	239
Erectors	239
Kind of Work Performed.....	239
Toolmaker	240
Bench Worker	241
Kind of Work Performed.....	241
Bench Lathe Worker.....	241
Engine Lathe Worker.....	241
Milling Machine Worker.....	243
Planer Worker.....	245
Shaper Worker.....	245
Slotter Worker.....	245
Drilling Machine Worker.....	248
Boring Machine Worker.....	248
Grinding Machine Worker.....	248
Kind of Work Performed.....	248
Special Machine Workers.....	253
Summary of the Trade Study.....	253
OUTSIDE AGENCIES FOR THE TRAINING OF MACHINISTS.....	255
Classes Established by the Board of Education.....	255
Day School Courses.....	255
Evening Trade School Courses.....	256
Courses Maintained Under Private Auspices.....	257
The Baron de Hirsch Trade School.....	257
The Hebrew Technical Institute.....	257
Pratt Institute.....	258
RECOMMENDATIONS OF TRADE COMMITTEES.....	259
Report of Advisory Committee.....	262

PART V

INDUSTRIAL CLASSES IN THE PUBLIC SCHOOLS

THE ADMINISTRATION OF INDUSTRIAL EDUCATION IN NEW YORK CITY....	265
The State Department of Education.....	265
The Board of Estimate and Apportionment.....	267
The Board of Aldermen.....	268
The Board of Education.....	269
Board of Examiners.....	270
Board of Superintendents.....	271
Supervision of Industrial Classes.....	272
Day Vocational Schools.....	272
Part-Time Industrial Classes and Industrial Co-operative Classes..	274
Evening Trade Classes.....	276
Advisory Board	279
Summary	279
Recommendations of The Advisory Committee.....	280
Essentials of Good Administration.....	280
Authority and Responsibility.....	280
The Pyramid Type of Scientific Organization.....	280
The Organization of Industrial Education in New York City.....	281
Non-Vocational Industrial Work.....	285
LICENSING AND EMPLOYMENT OF TEACHERS.....	289
Board of Examiners.....	289
Requirements for Eligibility for Vocational Licenses.....	290
Frequency of Examinations.....	291
How Examinations are Advertised.....	291
Order of Examinations.....	291
Second Examination	292
Written Examination	292
Practical Examination	293
Oral Examination	293
Physical Examination	293
Teaching Experience	293
Passing Marks	293
Substitute Licenses	293
Evening Trade School Licenses.....	294
Credit for Trade Experience.....	294
Credit for Teaching Experience.....	294
Number of Candidates Examined.....	295
Assistant Examiners	296
Attitude of Board of Examiners.....	297

Attitude of Those in Charge of Day and Evening Vocational Courses.....	298
Report of Advisory Committee.....	300
The Probationary Teacher of Shop Subjects.....	304
The Regular Teacher of Shop Subjects.....	305
The Probationary Teacher of Related Shop Subjects.....	305
Regular Teachers of related Technical Subjects.....	306
Probationary Teachers of Non-Vocational Subjects.....	306
Regular Teachers of Non-Vocational Subjects.....	306
Teachers of Industrial Evening Schools.....	306
Day Vocational Schools.....	309
Boy's Vocational School.....	309
Trade Subjects.....	310
Classification of Pupils.....	310
Holding Power of the School.....	311
Size of Class.....	314
Courses of Study.....	316
Relation between Academic and trade instruction.....	316
Organization of Shop Courses.....	317
Character of Instruction (Shop).....	318
The Teaching Staff.....	320
Building.....	321
Equipment.....	321
Records and Reports.....	321
Analysis of Costs.....	323
Summary.....	325
Murray Hill Vocational School.....	325
Location.....	325
Classification of Pupils.....	325
Holding Power of School.....	326
Attendance of Pupils.....	329
Progress of Pupils.....	329
Size of Classes.....	329
Courses of Study.....	330
Relation Between Academic and Trade Instruction.....	330
Trade Instruction.....	331
The Teaching Staff.....	333
Trade Teachers.....	334
Building.....	334
Equipment.....	335
Records and Reports.....	335
Analysis of Costs.....	336
Summary.....	337
Brooklyn Vocational School.....	337
Classification of Pupils.....	338
Holding Power of the School.....	338
Attendance of Pupils.....	340
Size of Classes.....	340
Courses of Study.....	341
Relation between Academic and Trade Instruction.....	342
Shop Instruction.....	342
The Teaching Staff.....	343
Trade Teachers.....	343
Building.....	343
Records and Reports.....	344
Analysis of Costs.....	344
Summary.....	345
Distribution of Pupils and Teachers in the Three Vocational Schools for Boys.....	346
Manhattan Trade School for Girls.....	348
Trade Departments.....	348
Classification of Pupils.....	348
Holding Power of the School.....	348
Attendance of Pupils.....	350
Size of Classes.....	350
Relation Between Academic and Trade Instruction.....	351
Character of the Instruction.....	351
Shop Practice.....	352
The Teaching Staff.....	353
Trade Teachers.....	353
Building and Equipment.....	354
Records of Pupils.....	354
Commercial Product.....	356
Summary.....	357

Report of the Advisory Committee on Day Vocational Schools.....	357
EVENING TRADE SCHOOLS.....	363
Courses and Classes.....	364
Director for Evening School.....	370
Requirements for Admission.....	370
Advertising	370
Registration of Pupils.....	371
Popularity of Subjects.....	372
Establishments of Courses.....	372
Length of Courses	372
Organization of Evening Trade Classes.....	373
Size of Classes.....	374
Courses of Study.....	374
Methods of Selection, Tenure and Salary of Evening Trade School Teachers	376
Supervision of Evening Trade Classes.....	377
Advisory Committee from the Trades.....	378
Study of Evening Trade School Pupils.....	379
Nationality and Parentage of Students.....	380
Previous School Training.....	381
Occupation of the Men.....	381
Number of Years Worked at Trade.....	383
Length of Working Days.....	383
Weekly Wages	384
Length of Attendance.....	385
Summary of Other Trade Groups.....	385
Character of Shop Instruction.....	395
Electrical Work	395
Plumbing	396
Machine Shop Practice and Theory.....	396
Carpentry and Joinery.....	397
Mechanical Drawing	397
Industrial Science	397
Building and Equipment.....	399
Harlem Evening Trade School.....	399
Murray Hill Evening Trade School.....	399
Long Island High and Trade School.....	400
Stuyvesant Evening Trade School.....	400
Bushwick Evening Trade School.....	400
Brooklyn Evening Trade School.....	401
Tottenville Evening Trade School.....	401
Manhattan Evening Trade School.....	401
Evening School of Industrial Art.....	401
Distribution of Pupils by Subjects.....	401
Summary	404
Report of Advisory Committee.....	405
CO-OPERATIVE CLASSES IN NEW YORK CITY HIGH SCHOOLS.....	411
The Co-operative System.....	411
The Co-ordinator	411
Co-operation of the High School Principals.....	411
Co-operation of the Employers.....	412
Beginning the Work.....	413
Development of Co-operative Classes.....	414
Re-organization of Co-operative Work.....	414
Distribution of Pupils in Co-operative Work.....	415
Limits of the Survey.....	419
Co-operative Industrial for Boys at Manual Training High School.....	420
Organization	420
Character of Instruction.....	420
Course of Study.....	421
Records of Pupils.....	422
Attitude of Employers toward Co-operative Movement.....	422
Co-operative Industrial Course for Girls at Washington Irving High School	427
Organization.....	427
Character of Work of Co-ordinator.....	427
Record of Pupils.....	429
Co-operative course in Salesmanship for Boys and Girls in Morris and Newtown High School.....	429
Course of Study.....	429
Results of Salesmanship Course	431
The Stuyvesant High School.....	431
Permanency of Work.....	432

Cost of Co-operative Work.....	433
Summary	434
Recommendations of Advisory Committee.....	435
PART-TIME INDUSTRIAL CLASSES.....	439
Aims, Types, Definition	441
Continuation and Part-time Industrial Classes.....	442
Scope of Survey.....	443
Part-time Industrial Classes at the Brooklyn Navy Yard.....	444
Part-time Industrial Classes at Long Island Railroad Shops.....	447
Part-time Industrial Classes at Baltimore and Ohio Railroad Shops.....	449
Part-time Industrial Classes at Richmond Light and Railroad Co....	451
Part-time Industrial Classes at Metropolitan Engineering Co.....	453
Summary	455
Report of Advisory Committee.....	456
RECOMMENDATIONS OF INDUSTRIAL EDUCATION SURVEY COMMITTEE.....	461
Administration	461
Employment and Licensing of Teachers.....	464
Central Schools	467
Day Vocational Schools.....	468
Evening Trade Classes.....	469
Voluntary Part-time Industrial Classes.....	470
Co-operative Classes	471
Furtherance of the Survey.....	473

To the Honorable Board of Estimate and Apportionment:

According to a resolution of the Committee on the Industrial Education Survey of New York City, authorized by the Board of Estimate and Apportionment on April 7, 1916, I have the honor to transmit herewith the report as to findings and recommendations.

Respectfully,

C. R. RICHARDS, *Chairman.*

FOREWORD

On September 29, 1915, as amended December 15, 1915, the Board of Education requested the Board of Estimate and Apportionment to appropriate \$15,000 for the purpose of co-operating with the United States Department of Labor in making an industrial survey for the better guidance of the Board of Education in its extension of industrial education.

The Board of Education was prompted to request funds for the purposes of an industrial survey by the demands of organized labor of the City of New York as expressed in the form of a "Declaration of Principles and Policies of Organized Labor of the City of New York" at a conference held April 20, 1915. This declaration was subsequently officially ratified and endorsed by the following organizations:

New York Central Federated Union; Brooklyn Central Labor Union; Bronx Labor Council; United Hebrew Trades; Allied Printing Trades; United Board of Business Agents of the Building Trades of Manhattan and vicinity; Metal Trades of Greater New York; Men's and Boys' Clothing Trades; Women's Trade Union League; Women's Garment Trades.

This statement which expresses the attitude of organized labor toward the extension of vocational training in the public schools of the city insists that such training shall be based upon and continually modified with reference to the industrial character of the community. The data upon which vocational training is organized must be gathered in the work shops of the city by a systematic and continuous survey which shall embrace the whole range of industrial activity. Upon only the basis of such a survey can instruction be adapted to the industrial needs of the community. "The school authorities must provide that sort of industrial training that employers and wage earners jointly demand."

As a result of these petitions the Comptroller, as Chairman of the Committee on Education of the Board of Estimate and Ap-

portionment, on December 15, 1915, sent a communication to the latter body outlining the plan of similar surveys and containing certain suggestions as to scope and organization and in which he recommended that the request of the Board of Education for \$15,000 be sent to the Board of Aldermen with the recommendation that special revenue bonds in the said sum be granted, the proceeds thereof to be used by a general survey committee appointed by His Honor, the Mayor, for the purpose of making an industrial survey under the conditions specified.

This recommendation was approved with the result that the following resolution was adopted by the Board of Aldermen on March 7, 1916, and approved by the Mayor on March 14, 1916:

Resolved, That, in pursuance of the provisions of subdivision 8 of section 188 of the Greater New York Charter, the Board of Estimate be and it is hereby requested to authorize the Comptroller to issue Special Revenue Bonds in the amount of Fifteen thousand dollars (\$15,000), the proceeds whereof to be used by a Committee to be appointed by His Honor, the Mayor, for the purpose of making an industrial survey for the better guidance of the Board of Education in its extension of industrial education;

That said Committee be given full power to expend this money in the making of such survey and in directing the same;

That said Committee be composed of twelve (12) members, of whom three shall represent the Board of Education, two shall be employers of labor, two shall be representatives of organized labor, one shall represent the Board of Estimate and Apportionment, one shall represent the Board of Aldermen, one shall represent the National Society for the Promotion of Industrial Education, one shall represent the New York State Department of Labor and one the United States Department of Labor;

That the appropriation of fifteen thousand dollars (\$15,000) herein made shall be for one year from the date upon which it becomes available, in order to insure the completion of the survey and the report thereon within twelve (12) months.

On April 7th the Board of Estimate and Apportionment approved the resolutions and added the following:

"and for the purpose of providing means therefor, the Comptroller be and is hereby authorized, pursuant to the provisions of subdivision 8 of section 188 of the Greater New York Charter, to issue special revenue bonds of the City of New York to an amount not exceeding fifteen thousand dollars (\$15,000), redeemable from the tax levy of the year succeeding the year of their issue."

The following Committee was appointed by His Honor, the Mayor, on the first of June:

C. R. Richards, Director of Cooper Union, Chairman.

John Martin, Member Board of Education.

*Thomas J. Carroll, Member Board of Education.

William J. Ettinger, Associate Superintendent of Schools.

Miss Florence M. Marshall, Principal, Manhattan Trade School for Girls.

Mrs. Mathilde C. Ford, Secretary, Committee on Education, Board of Estimate and Apportionment.

Charles Delaney, Board of Aldermen.

Royal Meeker, United States Commissioner of Labor Statistics.

George A. Stevens, New York Department of Labor.

Arthur D. Dean, Director, Division of Agricultural and Industrial Education, New York State Education Department.

C. G. Norman, President, Manhattan Fireproof Door Company

Frederick Alfred, President, M. B. Brown Printing and Binding Company.

Emil J. Deering, Business Agent, International Association of Machinists.

John J. Munholland, Pattern Makers' League of North America.

Mrs. Sidney C. Borg, Chairman, Committee on Investigation of Commercial Schools.

The Committee held its first meeting on June 27, 1916. At the second meeting on July 5, Mr. Lewis A. Wilson, Specialist in Industrial Schools of the New York State Department of Education, was appointed as director. Mr. Wilson was granted leave of absence by the department in order to undertake this work. It was decided at a subsequent meeting, on account of the limited time and resources at the disposal of the survey, to confine the industrial studies to the four trades of printing, machine work, inside electrical work and carpentry and joinery, and on the school side to investigate only the four day vocational schools maintained by the city and the evening, part time and co-operative industrial classes then in operation.

In the early fall a field and office staff was appointed and the active work of the survey began in November. The study of the printing trade was made by George Stein (composing room) and Fred F. Moran (pressroom); the electrical trade by Arthur O.

*Died October 27, 1916.

Maves and Paul Augustine; the carpentry and joinery trade by Francis Mahoney; the machinists' trade by J. P. Coughlin, J. Mason Knox and Lewis Rouillion. The field and office work in the studies of administration, licensing of teachers, day and evening schools was made by Herbert Blair, working under the director. R. D. Fleming assisted in the study of the evening schools and Arthur F. Payne of the co-operative and part-time classes. The field work of the trade surveys was, for the most part, finished in January, while that of the school survey continued through the month of May.

Early in the progress of the survey employers' organizations and labor unions representative of the four trades under study were invited to appoint committees to confer and co-operate with the director in regard to the conduct of the trade investigations. As a result committees were appointed by the following organizations:

Association of Employing Printers:

William Green, William Green, printers.

G. F. Kalkhoff, President, Kalkhoff Co.

Hiram Sherwood, President, Read Printing Co.

John C. Oswald, Oswald Press, Editor American Printer.

Gustav Zeese, Zeese-Wilkinson Co.

Frederick Alfred, President, M. B. Brown Printing and Binding Co.

New York Master Printers' Association:

Joseph C. Aste, The Aste Press.

William Kiesling, President, Master Printers' Association and President of the Kiesling Co.

William Driscoll, Vice-President, Master Printers' Association and Manager of the Lecouver Press.

Charles Francis, President, Charles Francis Press.

George J. Hurst, Hamilton Press.

Allied Printing Trades Council:

Leon H. Rouse, President, Typographical Union No. 6.

Theodore A. Douglas, Business Agent, Typographical Union No. 6.

Herbert F. Mulroy, Business Agent, Pressmen's Union No. 51.

E. W. Edwards, Secretary, Allied Printing Trades Council.
Philip Umstadter, President, Pressmen's Union No. 51.

Master Carpenters Association of the City of New York:

Hugh Getty, Hugh Getty, Inc.
W. S. Faddis, Cauldwell-Wingate Co.
William J. Hoe, James C. Hoe's Sons.
Richard Moller, Sloane & Moller, Inc.
R. B. Smith, R. B. Smith & Co.

United Brotherhood of Carpenters and Joiners of New York City:

Charles A. Judge, President and General Agent of United Brotherhood of Carpenters and Joiners of New York City.

John Halkett, Vice-President and General Agent of United Brotherhood of Carpenters and Joiners of New York City.

John Rice, Secretary of the United Brotherhood of Carpenters and Joiners of New York City.

John Towers, Secretary and Treasurer of the Concrete Alliance.

John Donovan, General Agent for the United Brotherhood of Carpenters and Joiners of New York City.

H. Blumenberg, Business Agent of the United Brotherhood of Carpenters and Joiners of New York City.

Independent Electrical Contractors' Association:

Louis Freed, President, Independent Electrical Contractors' Association; Prop. Jandous Elect. Equipment Co., 109 West 31st Street, New York City.

M. H. Bettman, Chairman of Comm.; Prop. Manhattan Elect. Const. Co., 108 West 17th Street, New York City.

William Bleyle, Prop. Bleyle Elect. Co., 84 Cortlandt Street, New York City.

George Brooke, Prop. Manhattan Elect. Maint. Co., 1989 Amsterdam Avenue, New York City.

Electrical Contractors' Association of New York:

L. K. Comstock, L. K. Comstock & Co.

E. J. H. Thiemer, Electrical Engineer and Contractor.

E. J. Murphy, New York & Queens Electric Light and Power Co.

Inside Electrical Workers of Greater New York, International Brotherhood:

William J. Walsh, President of the Inside Electrical Workers of G. N. Y. I. B.

G. W. Whitford, Secretary of the Inside Electrical Workers of G. N. Y. I. B.

Charles DuBourg, Vice-President of the Inside Electrical Workers of G. N. Y. I. B.

Arthur O. Maves, Chairman Examining Board, Inside Electrical Workers of G. N. Y. I. B.

Paul McNally, Business Agent of the Inside Electrical Workers of G. N. Y. I. B.

National Metal Trades Association:

Christopher Cunningham, Christopher Cunningham Co.

F. L. Schmidt, F. L. Schmidt Co.

Paul Pryibil, Paul Pryibil Co.

Charles Ross, C. Ross & Son Co.

Louis Doilling, De La Vergne Machine Co.

International Association of Machinists:

George H. Stilgenbauer, Business Agent and Secretary of Lodge 434.

M. J. Carney, Business Agent.

J. J. McEntree, Business Agent.

C. A. Durbin, Business Agent.

D. Walkins, Proprietor Walkins Garage.

These Committees held frequent conferences with the director during the progress of the survey and gave much helpful advice as to methods of collecting the desired data; later they checked the findings of the trade studies as to accuracy of fact and finally developed recommendations as to educational provisions for the respective trades.

Later in the progress of the survey a number of prominent school men in different parts of the country were invited to serve on advisory committees dealing with special phases of the educational problem. Each of these individuals accepted the invitation tendered with the result that the following Committees were organized:

Administration:

Leonard P. Ayers, Russell Sage Foundation, New York City.

C. A. Prosser, Director Dunwoody Institute, Minneapolis, Minn.

David Snedden, Teachers' College, New York City.

Licensing and Employment of Teachers:

C. A. Prosser, Dunwoody Institute, Minneapolis, Minn.

Arthur D. Dean, State Department of Education, Albany, N. Y.

Samuel S. Edmands, Pratt Institute, Brooklyn, N. Y.

Day Vocational Schools:

Charles R. Allen, State Board of Education, Boston, Mass.

Francis H. Wing, Director Vocational Education, Buffalo, N. Y.

E. E. McNary, Director of Vocational Schools, Springfield, Mass.

L. H. Carris, Assistant Commissioner of Education, Trenton, N. J.

Evening Trade Schools:

L. W. Mathewson, Director Industrial Department, Dickinson High School, Jersey City, N. J.

C. R. Dooley, Principal Casino Technical Evening School, Pittsburg, Pa.

O. B. Furney, Director of Evening Vocational Schools, Albany, N. Y.

Part Time and Co-operative Classes:

R. O. Small, Deputy Commissioner of Education, Boston, Mass.

E. A. Cooley, Director of Continuation Work, Milwaukee, Wis.

M. B. King, Assistant Commissioner of Education, Harrisburg, Pa.

A special advisory committee on provisions for the printing trade was also appointed as follows:

A. L. Williston, Director Wentworth Institute, Boston, Mass.

C. B. Connolly, Director of the School of Trades, Carnegie Institute, Pittsburg, Pa.

Wm. B. Kamprath, Principal Elm Vocational School, Buffalo, N. Y.

When the findings of the trade and school surveys were completed they were submitted to the various advisory committees which later met in New York City and formulated recommendations within their respective fields.

These recommendations together with the findings as a whole were finally considered by the survey committee and the recommendations formulated which appear in this complete report.

Separate pamphlets have been issued in five parts as follows:

1. The Printing Trade.
2. Inside Electrical Work.
3. Carpentry and Joinery.
4. The Machinist Trade.
5. Industrial Classes in the Public Schools.

PART I

THE PRINTING TRADE

DEVELOPMENT OF THE INDUSTRY

While various attempts were made by the Chinese and other Asiatics as early as the sixth century to print from wood engraved blocks, and while books printed from blocks were produced in Europe in the thirteenth and fourteenth centuries, it was not until the production of the 42-line Bible, about 1450, by Johann Gutenberg, of Mainz, Germany, that printing really became a recognized industry.

The press which Gutenberg used was built of wood, after the plan of a wine press. The movable type was cast from lead. A bed, or table, held the type, which was inked by hand, face up. In operating the press a piece of paper was first placed carefully on the type and the bed then moved back under a sliding block, which was forced down by a large hand screw. This action pressed the paper against the type and effected the printing.

Following the work of Gutenberg, only minor improvements were made in the printing press before the nineteenth century, when power was introduced to drive presses. At practically the same time the cylinder press was developed. This press, which made its appearance about 1813, introduced the method of placing the paper on a revolving cylinder and rolling it against the type. Frederick Koenig is credited with being the father of this type of press, since he was the first press builder to advise the use of a method by which the printing bed, or form, moved in unison with the impression cylinder.

From 1850 on, the developments in printing were so rapid as to revolutionize the industry. The cylinder press was followed by the rotary press, in which two cylinders were used, one carrying the paper and the other the plates.

In the work of producing newspapers Bullock is credited with being the inventor of the first perfecting press which made a quick production possible. R. Hoe & Company were the first press builders to manufacture another type of newspaper press,

the web rotary, by means of which newspapers were printed from stereotypes at greatly increased speed.

In addition to the rapid strides made in the development of printing presses within the last fifty years, equally important inventions have been made in typesetting machines, in the development of the half tone and other reproductive processes, and in other machines and processes which have served to place printing in the foremost rank of American industries.

EARLY PRINTING IN NEW YORK

Printing was introduced into New York in 1693 by William Bradford, who came to this city from Philadelphia, where also he had had the distinction of being the first printer. Bradford came in an official capacity, as printer to the province, which decreed that "he shall be allowed 40 L. current money of New York per annum for his salary and have the benefit of printing besides what served the publik." That sum, though small today, was also the salary of the surveyor-general, who gave all his time to the province. In printing books and in selling printed stationery, books and paper, Bradford soon became a man of substance, and a vestryman of Trinity Church. He was public printer for forty-eight years, with a subsidy, or salary, which gradually increased to 75 L. His first residence and place of business was in Pearl Street on the site of present Nos. 81 and 83. In 1714 his printing house was on the site of the present Cotton Exchange, and there, in 1725, he printed our first newspaper, the *New York Gazette*. The New York Historical Society has placed bronze commemorative tablets on both of these sites, an action which is suggestive of the importance of printing to a community, and one which was not bestowed on any other tradesman-citizen of early New York.

When William Bradford died, in 1752, there were three printing houses in New York, carried on by John Peter Zenger, Henry De Forest and William Weyman, the first two of whom had been apprenticed to Bradford. Zenger established the second newspaper in the city, the *New York Weekly Journal*, in 1726. Its criticisms of the governor were so pointed that Zenger was charged with libel and imprisoned pending trial. Certain issues of his paper were publicly burned by the "common hangman." Zenger thus became the hero of the most important trial which took place in colonial America, in which, after an imprisonment

of thirty-five weeks, he was triumphantly acquitted, the first publisher in history to controvert the legal maxim then prevailing that "the greater the truth the greater the libel." His counsel was presented with the freedom of the city, and Zenger was appointed city printer. A history of the trial was printed in 1735, and editions were issued in both England and America. Thus a printer, taught in New York, was an instrument in first establishing the right of free speech and the liberty of the press. The industry, now fairly established, steadily increased in extent and power. To meet its requirements the first type foundry was started in 1791.

The later development of the printing industry in New York runs parallel with the industrial development of the city. In 1838 the Bruce Typesetting machine, invented in New York, revolutionized typesetting. Some nine years later March Hoe invented the first rapid newspaper printing press, multiplying the impressions ten-fold. About the same time the first electrotyping machinery was constructed in New York. These three great inventions made New York for many years the center of progress in printing. These improvements were adopted in all countries, and for several years America's principal export of manufactures consisted of machinery for printing, typesetting and electrotyping, a business made possible in large part by the local growth of printing and publishing.

In more recent years the enterprise and ability of De Vinne encouraged the wood engravers of New York to attain great eminence in that art, excelling even the European standards; and when the half-tone process of engraving superseded wood engraving, it was again De Vinne, New York's master of typography, who taught the paper makers to make suitable paper and the press builders suitable presses for the new process with the result that for a long period New York printers excelled all others in the use of half-tone engravings.

IMPORTANCE OF THE PRINTING INDUSTRY

The importance assumed by the printed word in the minds of the American people is well shown when we consider the forward strides made by the printing and publishing industry within the

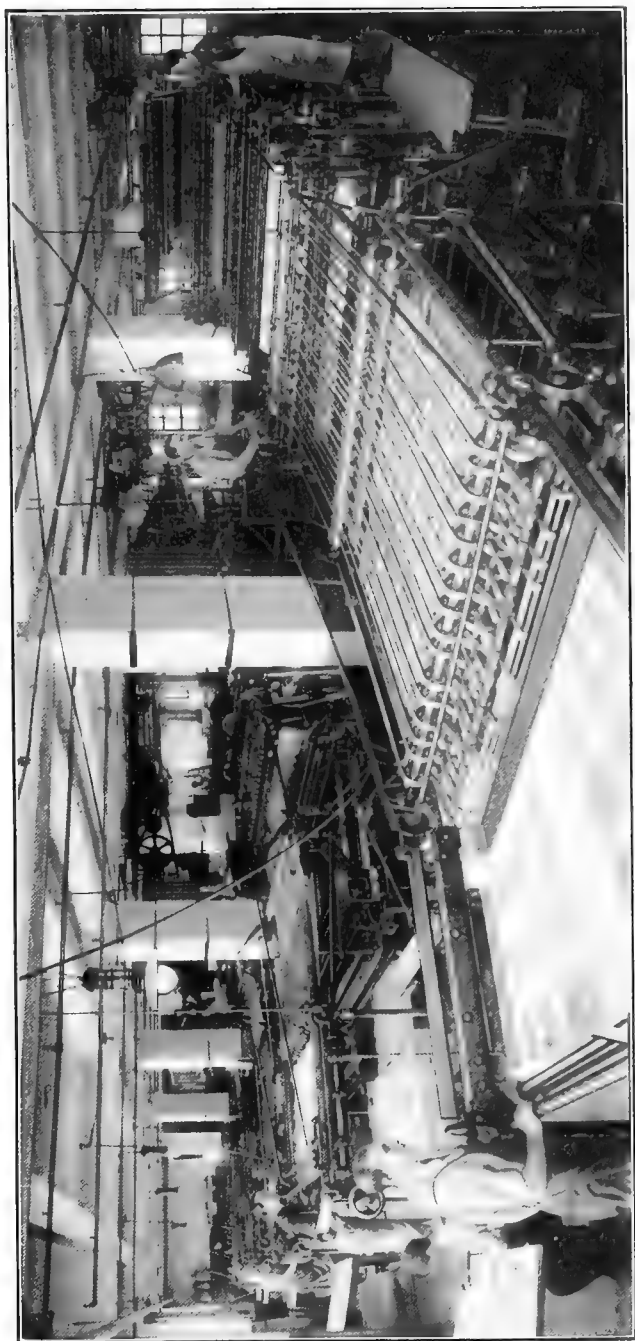
past half century. Fifty years ago printing and publishing in America was in the "infant industry" stage, with an annual output valued at about \$40,000,000. Today this figure has been increased to more than \$800,000,000 annually.

As printing is naturally a city industry, it follows that our largest cities should lead it. The position, however, which New York has gained is almost startling. Over one-fourth of the printing and publishing produced in the United States in 1914, according to the census, was done in the five boroughs of New York City. Of the various industries of the city, only the clothing industry surpassed it in value of product.

Some idea of the extent of printing and publishing in New York may be gained by again referring to the census figures for the year 1914. The industry represented in that year 2,650 establishments and 68,540 persons. In salaries and wages together there was paid out in that year approximately \$76,955,000.* The capital invested totaled \$155,587,228, while the value of the combined product of the printing and publishing trade amounted to \$215,570,954, *a value reckoned at one-twelfth of the output of the printing and publishing establishments of the world.* Indeed, in the value of output, New York is said to exceed London, heretofore the world's greatest printing city.

The cosmopolitan character of the printing done in New York is shown to the best advantage in newspaper printing. A total of 144 papers printed in 25 foreign languages are issued in this city. More than half the circulation of daily papers printed in foreign languages in the United States is held by publications issued within the borders of New York City. Some idea of the variety of languages in which these newspapers and periodicals are printed may be gained from the following table. Of the various languages enumerated in the table it is to be noted that Jewish leads with a total of 27, being closely followed by Italian, which numbers 23. Periodicals in these two languages constitute 35 per cent. of the total number published.

*This includes bookbinding and blank book making, engraving steel and copper plate, plate printing, lithographing, book, job, music, newspaper and periodical printing and publishing.



SECTION OF A LARGE COLOR PRESS ROOM

FOREIGN NEWSPAPERS PUBLISHED IN NEW YORK CITY

	Weekly	Monthly	Daily	Total
Arabic	6	1	2	9
Armenian	1	1	.	2
Bohemian	1	1	2	4
Chinese	3	.	.	3
Croatian	2	1	2	5
Finnish	1	.	.	1
French	.	1	1	2
German	8	2	5	15
Greek	.	.	2	2
Hungarian	7	2	3	12
Italian	11	7	5	23
Japanese	2	.	.	2
Jewish	20	2	5	27
Lettish	1	.	.	1
Lithuanian	3	.	.	3
Norwegian-Danish	2	.	.	2
Persian	1	.	.	1
Polish	3	.	2	5
Roumanian	2	.	.	2
Russian	4	2	3	9
Serbian	1	.	1	2
Slovak	2	.	2	4
Slovenic	1	.	1	2
Spanish	2	1	.	3
Swedish	3	.	.	3
	87	21	36	144

TYPES OF PRINTING ESTABLISHMENTS

According to the census there were 2,650 shops in New York City in 1914 ranging in size from the "one man shop" with its small job press and a few frames of type to the establishment with seventy-five presses, including the latest and fastest two-color presses, and a modern composing room employing 300 hand and machine compositors. The product represents all classes and grades of printing, from the cheapest hand bill or card to the most expensive and elaborate catalogue or book.

These shops may be divided into two major types; the newspaper office, which, through its publication, sells a service to the public in furnishing daily news; and the commercial and job printing establishments, which produce a manufactured article sold in bulk to its patrons. There are also a number of typesetting shops that specialize in setting type. The various types of shops are described in the order of their importance.

COMMERCIAL AND JOB SHOPS

Over two-thirds of the printing of New York is produced in the commercial and job shops; the commercial shop with hand and machine composing room equipment and cylinder, web and job presses; and the small job shop with only hand type equipment and job presses. The commercial shops print books, magazines and catalogues, while the small job shops usually print hand bills, cards, stationery, booklets, price-lists, etc.

Every kind of printed matter is produced in these shops, such as books, catalogues, trade papers, weekly papers, magazines, business stationery, blanks, forms, advertising literature and advertising novelties, calendars, labels, paper bags, boxes, posters, show cards and badges.

NEWSPAPER OFFICES

The newspaper offices in New York, with one exception, print only their own publications. From their presses come daily twenty regular newspapers printed in English and thirty-six foreign dailies representing fourteen different languages. These papers have a daily circulation of over 5,000,000 copies. There are also numerous daily publications which are not considered general newspapers, giving market and trade reports and news of a special character.

None of the English dailies is of recent birth; all have been factors in the history and growth of the city and country and are known and read in all parts of the English-speaking world.

The demands upon the daily newspaper for the quick dissemination of news has been the most important factor in the mechanical development of the printing trade. As a result of this demand the typesetting machine was perfected and presses built that deliver an edition of 48,000 twenty-four page papers one hour after the plates are received in the pressroom. This machinery would seem to be all that is humanly possible in the way of accuracy and speed, but experimenters are constantly devising improvements.

TYPESETTING SHOPS

There are about 50 shops in New York City which specialize in typesetting. These shops are equipped with modern composing room machinery and set type for printing firms.



SECTION OF MODERN NEWSPAPER COMPOSING ROOM—NEW YORK TIMES

RECENT DEVELOPMENTS IN THE PRINTING TRADE

A new era in the commercial printing industry may be said to have begun with the development of the halftone engraving process. This process provides an inexpensive means of illustrating articles and furnishes a means of graphic advertising for the manufacturer and merchant. On the other hand the development of a new business, that of the professional advertiser, has given an added impulse to commercial printing. The New York City Red Book Telephone Directory gives the names of 745 companies and firms which conduct advertising agencies and it can be readily imagined that the work of these firms tends greatly to increase the volume of printing.

The industry has kept pace with this constantly increasing demand for product. No other industry requires a larger expenditure for machinery in proportion to output, and the increased capital invested in the printing industry during the past five years (\$32,442,000) is slightly more than the increased value of the annual product (\$32,061,000).

Within the past ten years many commercial structures, especially fitted for the printers' requirements, have been erected in the city, and high speed presses and other modern printing equipments of a kind undreamed of fifteen years ago installed within them. Within the last ten years about twenty reinforced concrete buildings have been erected in the Borough of Manhattan for the occupancy, almost entirely, of the printing and allied trades. These buildings are of an average height of eleven stories, the largest being the Printing Crafts Building, twenty-two stories in height, having a floor area of 528,000 square feet.

CENTRALIZATION OF THE PRINTING INDUSTRY

The center of the printing industry in New York City is located at the lower west side of the Borough of Manhattan, between 25th Street and 43d Street. For many years the printing district was located below 25th Street, but during the past few years it has gradually moved uptown. The center of the trade will in all probability remain where it now is for many years due to the new buildings that have been erected by printers in this district.

Some idea of the centralization of the trade may be gained from the fact that 87 per cent. of the people engaged in the

printing industry in Greater New York work in the Borough of Manhattan. This fact should, of course, influence in a large degree the location of any school offering courses to the workers engaged in the trade.

NUMBER OF COMPOSITORS AND PRESSMEN IN NEW YORK CITY

It is difficult to determine the exact number of workers in the composing and pressrooms of the city. The United States Census report for the year 1914 gives the number of pressmen and compositors in New York City as 24,014. The distribution of these workers in the trade is shown in the following table:

Kind of Work	Males	Females	Total
Compositors and Typesetters.....	16,606	652	17,258
Proofreaders	478	322	800
Pressmen	2,651	5	2,656
Press Feeders	1,496	351	1,847
Apprentices*	1,370	83	1,453
	22,601	1,413	24,014

The members of the survey staff secured information as to the exact number of compositors and pressmen employed in the daily newspaper offices in the city. The following table shows the distribution by occupations of the 3,706 men employed in these offices:

NUMBER OF WORKERS EMPLOYED IN THE COMPOSING AND PRESS ROOMS OF THE DAILY NEWSPAPERS, PRINTED IN ENGLISH

COMPOSING ROOM		PRESS ROOMS	
Linotype Operators.....	658	Pressmen	1,040
Handmen	562	Flyboys and Apprentices.....	439
Proofreaders	199		1,479
Makeup Men.....	129		
Apprentices	76		
Linotype Machinists.....	70		
Foremen	46		
Monotype Operators.....	45		
Bankmen	30		
Copy Cutters	29		
Monotype Machinists.....	12		
Extra List.....	371		
	2,227		

*Includes apprentices in other branches of the trade.

The men on extra list report at the newspaper office each day and if the edition is sufficiently large they are employed.

An attempt was made to secure information as to the number of men employed in the commercial and job shops.

Forty-five hundred questionnaires were sent to these shops asking for information as to the number of men employed in each type of work. Replies were received from 732 establishments, employing 11,285 men. The following table shows the distribution of these men in the industry:

COMPOSING ROOM		PRESS ROOMS	
Handmen	3,075	Pressmen	
Machine Operators.....	981	Cylinder	1,140
Two Thirders.....	536	Platen	555
Apprentices	485	Job Cylinder.....	321
Machinists	97	Rotary	147
		Magazine	159
		Book Web.....	147
		Offset	25
	5,174	Feeders	
		Job	1,687
		Cylinder	1,658
		Magazine and Book Web.....	240
		Offset	32
			6,111

The following estimate of the total number of men employed in the composing and pressrooms in the commercial shops and newspaper offices in Greater New York was based on the above data, a study of union records and conferences with the committees appointed by the employers' associations and unions:

ESTIMATED NUMBER OF COMPOSITORS AND PRESSMEN EMPLOYED IN NEW YORK CITY JANUARY 1, 1917

Compositors	15,278
Pressmen	4,900
Feeders	5,875
Total	26,053

SIZE OF SHOPS

Seven hundred and thirty-two establishments furnished information as to the number of men employed. Thirty-three per cent. of these firms employed ten or less workers and less than

3 per cent. employed 100 workers or over. The following table shows the number of men employed in shops by groups:

No. of Wkrs. ..	1	2	3	4	5	6 to 10	10 to 25	25 to 50	50 to 100	100 to 200	over 200
No. of Shops ..	26	85	69	66	72	164	167	52	12	6	3

NATIONALITY OF WORKERS

It is impossible to determine with accuracy the nationality of those who are engaged in the composing rooms of New York City. The 1910 U. S. census gives the number of compositors, linotypers and typesetters as 16,826. Of this number 11,534, or 68 per cent., are given as native born and 5,292, or 32 per cent., as foreign born.

Among the 2,668 pressmen, 2,109, or 79 per cent., were of native birth (either of native, mixed or foreign parents), as against 559, or 21 per cent., foreign born.

In the survey of the evening trade classes maintained by the city, 310 men who were attending the printing classes filled out questionnaires. Of this number 219, or 71 per cent., were native born and 91, or 29 per cent., were foreign born.

A study was also made of the application blanks of the men who applied for membership to the New York Typographical Union No. 6, an organization enrolling half of the compositors in New York. One thousand cases were taken, which included all who applied for membership during the four years 1913 to 1916. Of this number 791, or 79 per cent., were found to be native born and 209, or 21 per cent., were foreign born. When this situation is compared with the conditions in other skilled trades, such as carpentry with 70 per cent., or brick and stone masonry with 66 per cent. of foreign born workers, the contrast is strikingly apparent.

WHERE THE WORKERS ARE TRAINED

It is more difficult to determine where the New York printer learned his trade than to determine his nationality. The census gives no information on this point and the question was not asked of the men attending the evening schools. Of the 1,000 men who joined the New York Typographical Union No. 6, between the years 1913 and 1916, 231, or 23 per cent., had received

their training outside of the city, usually in small newspaper offices, and 769, or 77 per cent., had been trained in New York City. Many of the latter group began in small job and commercial offices, picking up such information as the opportunities of the shop afforded and applied for membership in the Union after the years of apprenticeship had been served. Others joined the Union first as Union apprentices and remained during the entire apprenticeship period.

A study of the records of 1,040 members of the Newspaper Pressmen's Union shows that 155, or 15 per cent., had received their training outside of the city and 885, or 85 per cent., had been trained in the city.

THE TRANSIENT PRINTER

Many printers are attracted to this city because of the higher wages and remain here for indefinite periods. A large number of printers trained in the city become dissatisfied for one cause or another and go to other places. It is difficult to determine what percentage of the printers who come to New York remain and what percentage leave after a few months or years.

A study of the records of the Typographical Union No. 6 for the years 1914-1916 shows that an average of 817 traveling cards are received and 761 traveling cards are issued annually. An examination of the Pressmen's and Feeders' Unions shows that an average of 200 traveling cards are received and an average of 200 are issued annually.

A conservative estimate would seem to indicate that at least 1,500 printers come to the city and nearly as large a number leave the city each year.

The confirmed transient printer is in a way an anomaly. In a large number of cases he is the type of man who fails to stick to his job. He much resembles the casual worker. Some peculiarity in his makeup prevents him from staying very long in any one place and he is always willing to move on to another city. Of course, there is always a certain percentage of workers who, on account of strikes, dissatisfaction or other reasons, decide to leave one city to take up their trade permanently in another. This class, however, can hardly be included under transients.

With the increasing demands made by the trade for men of regular habits who will "stick to the job," the days of the

transient printer would seem to be numbered. Each year the number of men who join the ranks of the transients grow less and there is no doubt that within a few years the transient printer will be as much of a rarity as the old type of tramp printer is now.

FLUCTUATION OF EMPLOYMENT

There is but little variation, month by month, in the number of men employed in the printing industry. In the book and job shops the minimum number employed during the year is 90 per cent. of the maximum number employed. In the publication of music the difference is still less, as the minimum number is 95 per cent. of the maximum, and in the newspaper offices there is but 4 per cent. in range.

However, the number of men employed does not always tell a complete story in regard to steadiness of labor conditions. In dull times firms in many industries, loath to lose their trained workers and resort to part time employment for a large number rather than continue full time employment for a small number. This is also true of the printing trade, though there is probably less part time employment among printers than among any other class of skilled workers.

NIGHT WORKERS

In developing a plan for teaching the workers now engaged in the printing trade, consideration must be given to the large proportion of these workers employed at night. Of the 5,000 men employed in some capacity in newspaper printing, approximately 50 per cent. work at night, either on the shift which works between 6 p. m. and 3 a. m. or on the "lobster" shift, which works between 2 a. m. and 10 a. m.

In addition to the men working on newspaper printing about 10 per cent. of the 20,000 printers engaged in job and commercial printing are engaged on night work. Moreover, in the busy season, which begins early in the Fall, overtime work requires a large number of printers to work at night. Night work indeed in the printing trade is of greater importance than in any other important skilled occupation.

TRADE ORGANIZATIONS

EMPLOYERS' ASSOCIATIONS

The owners of the printing plants in the City of New York are represented by three organizations—The Association of Employing Printers of New York City, The Master Printers' Association and the Newspaper Publishers' Association.

The Association of Employing Printers is composed of the owners of commercial printing houses in New York City, employing large numbers of men and producing in the neighborhood of 75 per cent. of the printing product of the city. The Master Printers' Association is composed of owners of small shops in the city. The Newspaper Publishers' Association, as the name implies, is composed of the publishers of nearly all the newspapers in the city. Not all of the owners of printing plants in the city are affiliated with these associations, but the majority are connected with some one of the three.

Most of the large shops which have membership in these associations have contracts with the local organizations of workers, in which they agree to employ only members of the local union. There are both individual contracts and association agreements between employers and unions. The conditions under which work shall be carried on, the scale of wages and regulations for apprentices, are also set forth in the contract. In return the employers are protected by their contracts against walkouts, strikes, boycotts or any other form of concerted interference with the peaceful operation of the departments over which the unions have jurisdiction. All disputes arising over scale provisions, wages, hours or the reviewing or extending of contracts are subject to local arbitration, if such disputes cannot be settled through conciliation. The Conciliation Committee appointed by the unions and the employers' association endeavors to settle all such disputes, but in case of failure local arbitration is resorted to. Each side appoints a representative and these two representatives choose a third. The Board of Arbitration so constituted takes evidence and submits its decision. At present there is no arbitration agreement between the Newspaper Publishers' Association and the Typographical Union.

UNIONS

The labor organizations represented in composing rooms and pressrooms of the city are:

Typographical Union No. 6
Typographical Union No. 7 (German)
Typographical Union No. 83 (Jewish)
Typographical Union No. 131 (Bohemian)
Typographical Union No. 261 (Italian)
Typographical Union No. 440 (Hungarian)
Pressmen's (Cylinder and Job) No. 51
Newspaper Web-Pressmen's Union No. 25
Franklin Assistants Union No. 23
Job Press Feeders No. 1

There are also unions of bookbinders, stereotypers, electrotypers, photoengravers and mailers.

The unions are affiliated with international bodies and are represented through three delegates in a local Allied Printing Trades Council.

The local Allied Printing Trades Council is the representative of the International Allied Printing Trades Association, an organization composed of the executive officers of the five International Printing Trades Unions: International Typographical Union, International Printing Pressmen's and Assistants' Union, International Photo-Engravers' Union, International Stereotypers' and Electrotypers' Union and the International Brotherhood of Bookbinders. This body is the owner of the Allied Printing Trades Union Label. The Local Council enforces the rules established for its protection. It is also active in other trade matters, such as assisting in the enactment of labor legislation, opposing hostile legislative measures, adjusting disputes between unions and employers and between the unions themselves.

Besides their activities in establishing and maintaining wage scales, reasonable hours of labor and fair working conditions, internationally and locally, the unions have many educational and beneficial features designed to win and hold members of the crafts.

The International Typographical Union has a home for its

aged and a tuberculosis sanitarium at Colorado Springs, Colorado. This institution is known as The Union Printers' Home. It is supported entirely by assessments levied on the membership and is worth over one million dollars. There the old printer, who has no family ties, can spend his declining years in comfort and security. There, also, members afflicted with tuberculosis can receive the latest scientific treatment for that disease. One of the features of the Home is its library. Autographed copies of the books of many contemporary authors have been contributed. Former Representative in Congress, Amos J. Cummings, bequeathed his entire collection of books and documents to the Home library. It grants a pension of \$5 per week to those with twenty years membership who are unable to work, it pays mortuary benefits ranging from \$75 to \$400 to families of deceased members and gives correspondence courses in printing for the improvement of apprentices and journeymen.

In New York City, Typographical Union No. 6 contributes an equal amount with the local Newspaper Publishers, Employing Printers' Section and the Hudson Guild (a philanthropic institution) toward the support of a school for printers' apprentices. The Union also maintains a local old age pension fund, and has a hospital fund for the endowment of beds in the principal hospitals of the city.

Most of the men working in the pressrooms of New York City and vicinity are members of some one of the four organizations claiming jurisdiction over pressroom positions.

The pressmen working in the commercial shops are members of the Pressmen's Union No. 51. The pressmen working in the newspaper shops are members of Web Printing Pressmen's Union No. 25. The cylinder press feeders and assistants on the web presses in the commercial shops are members of Franklin Assistants' Union No. 23. The job press feeders are members of the Job Press Feeders' Union No. 1.

The pressmen's organizations are affiliated with the International Printing Pressmen's and Assistants' Union of North America. This International Union is one of the most progressive labor organizations in the country. It owns 1,100 acres of land at Rogersville in the mountains of Eastern Tennessee, where it maintains a beautiful home for its superannuated members; a well equipped sanitorium for the members afflicted with tubercu-

losis and the best equipped school for press work in the world. The executive offices of the International are located at Rogersville, and the annual conventions of the Union are held there in their own convention hall. The Union maintains very comprehensive correspondence courses in platen press, cylinder press, web press and planographic press work. Both employers and employees consider these the best courses in printing presswork ever published. They also maintain an old age pension fund, whereby an old member who retires from the trade receives \$5 per week as long as he lives. A mortuary benefit of \$100 is also paid.

THE COMPOSING ROOM

The need of the daily newspaper for speed in production and the consequent introduction of new methods has had a great influence upon the printing trade at large. Especially is this true in the composing room of commercial establishments. The newspapers not being in the strictly competitive field of printing, are better able to try out experimental machinery than the commercial shops, and are constantly seeking quicker methods of doing the work in their mechanical departments. The cry is "Speed! Speed! More speed!"

Before the invention of typesetting machines all type was made in type foundries, which were not a part of a printing office. This hand type was movable type and was laid in type cases. The compositor "threw in" his type and set it out. The distributing process required about one-third of his time.

EVOLUTION FROM HAND SETTING TO MACHINE COMPOSITION

The linotype was the first successful typesetting machine. This machine marked a revolution in newspaper composing room work. What four fast hand compositors formerly set in eight hours one "swift" linotype machine operator can now set in seven.

The product of the linotype and the present intertype machines is a line of type set according to copy the width of a column, in length called a "slug."

These slug-casting machines cast type from the size known as agate* (14 lines to an inch) to 24 point (1.3 inch), which is used for the small reading matter (body type) and for headings and display lines in advertisements. There are also special head-letter machines in newspaper offices adapted to the styles and

*NOTE—Linotype, Intertype and Monotype machines can cast smaller sizes than agate, but these sizes are not in common use, and are usually set by handmen from foundry type cases.

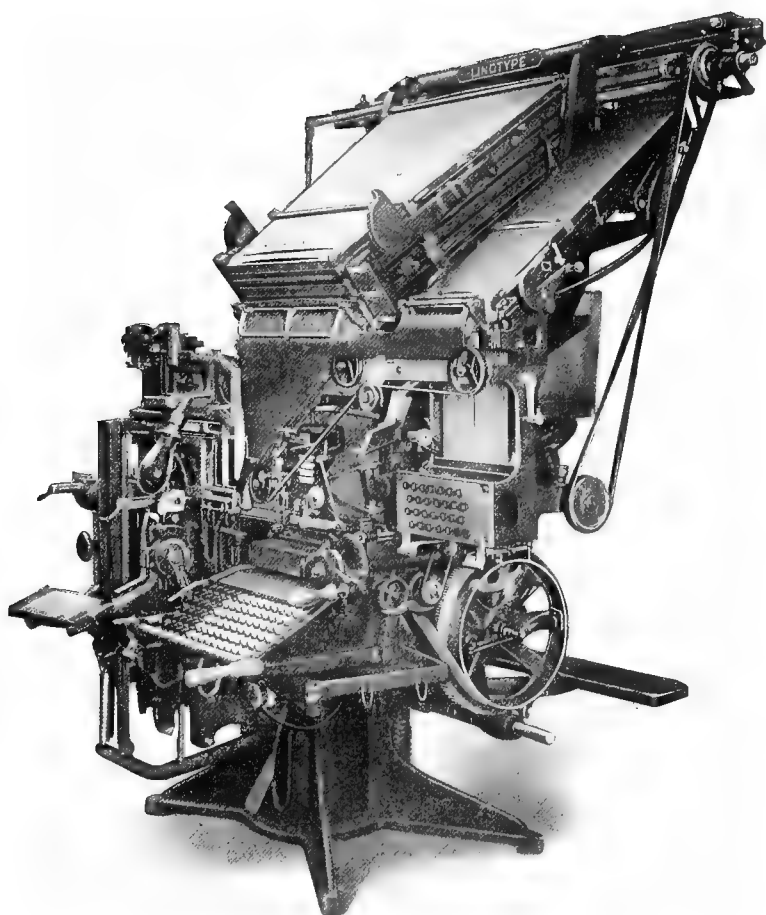
sizes of letters used in headings at the beginning of articles. It is still necessary to set certain kinds of matter in movable type. For tabular work (railroad time tables, tariffs, etc.); dictionaries; matter where cuts (illustrations) are introduced and the measures broken up; and work where it is known in advance that there are to be many corrections it is more economical to use the product of the monotype machine (see description) which makes movable type, i. e., each character, space and quad in a single piece.

The monotype (movable type) casts type set according to copy from agate ($1/14$ inch) to 36 point ($1/2$ inch) and is used for reading matter, but especially for tabular work and display. It also casts spaces, quads, leads, rules and slugs.

Another slug-casting machine, the slug display line caster makes possible the casting of large type display lines in one piece. This is accomplished by the linotype principle adapted to type sizes larger than 12 point ($1/6$ inch). This machine casts from 14 point ($7/36$ inch) to 60 point ($5/6$ inch) and any width up to $26\frac{1}{2}$ ems ($4\frac{5}{12}$ inches). The method used is the same as in hand composition, except that the typesetter sets matrices (dies) into a stick by hand, fits the assembled matrices with the stick into the casting machine, casts a slug and distributes the matrices back into the case, in which they are kept for future use. The slug is known as an overhanging slug on a 12 point base. When ready to make up, the overhanging part of the slug must be supported underneath by leads or slugs of the right height to prevent breaking off. The height of the base corresponds to the height of the leads and slugs cast by the monotype or linotype lead caster, so there is plenty of the supporting material needed in most newspaper composing rooms.

THE "NON-DISTRIBUTION" SYSTEM

These typesetting machines have not only made possible a great saving of time in setting type but have effected another great economy in the matter of distribution. When the material cast in these machines, type, leads, slugs, rules and borders, has been used it is not distributed in cases, but is remelted and used again to feed the machines. In this way the time of distribution is saved. This method gives a new face of type on every day's edition, and accounts for the good typographical appearance of the modern newspaper.



THE LINO TYPE

These processes have all tended to reduce the number of handmen required in a newspaper composing room and the changes, while gradual, have had the effect of forcing handmen either to learn the operation of machines or to seek work in commercial shops. When the handman does learn machine operation, he is likely to be more adept in setting matter used for advertisements and display than an operator who has had no training in this branch of the work. Handmen will always be required in composing rooms to assemble, make up and lock up type set on machines, but not in such numbers as formerly. When the handman is ready to assemble an advertisement or display matter he takes all the type for the job which has been set on the machines and sets the displayed lines (i. e., the larger lines which are used to emphasize the subject) and cuts borders and inserts rules and cuts. In a modern newspaper composing room, if there is no line larger than 36 point ($\frac{1}{2}$ inch) in a piece of displayed matter there is no necessity of distributing any part of it back into the type cases. If an advertisement or display matter contains a line larger than 36 point ($\frac{1}{2}$ inch) it is either a line of foundry type or one made on a slug display-line caster. If the former, the line must be lifted from the matter when the used form is to be broken up, and distributed into its proper case.

The commercial shop soon avails itself of whatever has proven efficient and economical in the newspaper plant and the tendency to the introduction of typesetting machines in the former soon became marked. All improvements of late years have taken this course and the "non-distribution" system is the next step toward efficiency and economy in the commercial shop and is rapidly being introduced.

EFFECT OF "NON-DISTRIBUTION" SYSTEM ON HANDMEN

The handmen feel the effect of the introduction of the "non-distribution" system just as soon as it is introduced, but it effects the less skilled among them more than the highly skilled. In every shop there are men who lack confidence, or initiative, and who must be instructed in detail. They are kept at such simple tasks as distribution, setting from reprint and assisting other journeymen who have charge of publications or other kinds of work. With the "non-distribution" system in vogue their principal occupation is gone. If they have not the ambition to take

up and master the new processes they must suffer the consequences that follow a loss of steady employment. For such men a school giving a course of study in composing room work would be a great help and a course for journeymen would, no doubt, be eagerly grasped by many of them. Such men are reluctant to attend schools where there are mixed classes of apprentices and journeymen. A separate course for journeymen seems the right solution for this class of printers.

The evolution from hand setting to machine composition forms a chapter in the history of printing that is brilliant in mechanical achievement, but tragic for the wage earner who could set only straight matter and who was brushed aside by the new devices. The trade could not absorb all of these handmen; one out of every four being sufficient under the new conditions. The misery of those days was alleviated partly by local unions furnishing out-of-work relief, and by the establishing of an old age pension fund by the International Typographical Union. Gradual adjustment to the new order was bound to come. The handman whom the trade could not support drifted away and the machine operator took his place as the typical craftsman.

FUTURE FIELD OF THE HAND COMPOSITOR

The field of the hand compositor is also being invaded by the designer and engraver. Cover pages, artistic type display for advertisements, booklets, menus and the better class of commercial printing was once the work of the artistically inclined handman and in shops where the latest faces produced by the type foundries are purchased he is still able to compete, in a measure, with the designer and engraver. But whenever a customer now wants a particularly attractive piece of work, he calls in the designer, whose hand lettering and decorations are likely to be far superior to anything the typesetter can construct from the material at his disposal in most composing rooms. The photoengraver transforms the designer's work into shape for printing and thus eliminates the compositor with artistic tendencies. Considerable opportunities are open to this class of handman by developing their latent artistic talents through the study of hand lettering and designing. With a knowledge of letter forms and type faces the handman starts with an equipment that will enable him to master the technique of this new art more rapidly and more thoroughly than one who never handled type.

***UNION SCALE OF WAGES FOR COMMERCIAL SHOP
COMPOSING ROOMS**

	DAY 8 Hours	NIGHT 8 Hours
Apprentice	\$ 6.00-\$22.50	\$ 6.00-\$22.50
Handman	\$25.00	\$28.00
Monotype	\$26.00	\$28.00
Linotype and Intertype operators	\$26.00	\$28.00
Makeup	\$25.00	\$28.00
Stonehand	\$25.00	\$28.00
Proofreader	\$25.00	\$28.00
Machinist	\$26.00-\$31.50	\$31.00-\$36.50
Foreman	\$30.00 up	\$30.00 up

Piece workers receive from \$0.46 to \$0.56 per 1,000 ems. This affects only three union shops in New York City where piece work rates are in operation. The third (midnight) shift rate is \$31 for 7 hours for all, including 30 minutes for lunch. The 7 hours may be arranged for any time between 1 a. m. and 10 a. m.

Rate for overtime—price and one-half. Rate for Sunday and holidays—double price.

The wages for compositors in non-union shops range from \$15 a week to the maximum of the union scale. The wages paid in non-union shops are, as a rule, lower than the wages paid in the union shops. The eight-hour day is generally observed except in the smaller shops.

**†UNION SCALE OF WAGES FOR DAILY NEWSPAPER
COMPOSING ROOMS**

	DAY 8 Hours	NIGHT 8 Hours	MIDNIGHT 7½ Hours
Apprentice	\$ 7-\$20	\$7-\$21-\$23	\$7-\$24
Handman	\$30.00	\$33.00	\$36.00
Monotype	\$30.00	\$33.00	\$36.00
Linotype and Intertype Operators	\$30.00	\$33.00	\$36.00
Bankman	\$30.00	\$33.00	\$36.00
Copy Cutter	\$30.00	\$33.00	\$36.00
Makeup	\$30.00	\$33.00	\$36.00
Proofreader	\$30.00	\$33.00	\$36.00
Machinist	\$25.00-\$31.00	\$31.00-\$36.00	\$31.00-\$36
Foreman	\$50 and up	\$50 and up	\$50 and up

*As this report was being printed an agreement was entered into by the Printers' League Section and Typographical Union No. 6 for a flat raise of \$2.00 per week for all journeymen.

†As this report was being printed, a new scale was presented to the Newspaper Publishers by the Union seeking an advance of \$6 per week.

Rate for overtime—price and one-half.

There are only two non-union daily newspaper composing rooms in New York City. The wages and hours in these shops are the same as in union shops. No holidays on morning newspapers, but afternoon dailies observe Thanksgiving, Christmas, New Years and Fourth of July.

APPRENTICE TRAINING IN THE COMPOSING ROOM

The training that an apprentice receives in the composing room is better than similar training in most industrial occupations. If a boy does satisfactory work, he becomes a journeyman at the end of five years. This assurance of a journeyman's wage at the expiration of a definite period of training attracts many boys to this branch of the trade.

The art of printing is continuously educative, especially to the typesetter. The primer and the treatise on differential calculus come to him as a part of his daily work. Some of the copy he reads may leave an impression on his mind. All of it adds to the sum total of his intelligence. His work, his environment and his associations tend to make him a good citizen in any community.

COMMERCIAL AND JOB SHOPS

A study of the records received from 732 commercial and job shops shows that there are in these shops 4,153 hand and machine journeymen compositors, 536 two-thirders† and 485 apprentices employed in the composing rooms. From figures collected by survey staff and committees it is estimated that there are in round numbers approximately 1,250 apprentices in the composing rooms of New York City. The two-thirders may be classified either as journeymen or apprentices. If they are eliminated the data shows that there are about twelve apprentices to each hundred journeymen.

In New York City nearly all the large shops have trade agreements with the union providing for the length of apprenticeship, the number of apprentices to be employed in each shop, the work to be done each year of the apprenticeship, the wages to be paid and other details. The union insists that the number

† "Two-third" is a craft term designating one who has not reached the competency of a journeyman, and is usually paid two-thirds of a journeyman's wage.

of apprentices shall not exceed the number stipulated in the agreement, and that each apprentice shall be required to serve a full term of five years.

These agreements provide that there shall be but one apprentice for every eight journeymen or major fraction and that not more than eight apprentices shall be employed in any one office. Each union office of any size shall be allowed at least one apprentice, and each newspaper shop is limited to four apprentices.

Following is an excerpt from the Scale of Prices of New York Typographical Union No. 6, giving in detail the rules governing the employment of apprentices agreed to between the Printers' League of America and the Closed Shop Division of the United Typothetae (employing printers) and the Union:

RULES GOVERNING THE EMPLOYMENT OF APPRENTICES

In book and job offices apprentices may be employed in the ratio of one to every eight men or a majority fraction thereof; but no more than eight apprentices shall be permitted in any office. Each union office shall be allowed at least one apprentice. In offices where the work fluctuates, the average for the preceding year shall be the basis for the number of apprentices.

Any office not doing hand composition, but confining itself exclusively to machine composition, shall not be allowed any new apprentices after the adoption of this scale.

In the first year an apprentice shall be required to perform general work in the composing room at the discretion of the foreman at any work which he may be deemed capable of doing.

The foreman is required to test the ability of all apprentices under his charge during the first year of their service, to determine the fitness of such apprentice for the trade. The apprentice shall thereupon receive from his foreman a written statement of his qualifications, copy of which he shall file with the union and the organization to which this office belongs. Should an apprentice be proven incapable he shall then be refused further work at this branch of the trade. Any dispute arising through this measure with any office not in the Printers' League or Closed Shop Division of the Typothetae may be laid before the Joint Conference Committee of either the Printers' League or Closed Shop Division of the Typothetae and Typographical Union No. 6, at which all parties concerned shall be present.

In the second year an apprentice shall be employed at least fifty per cent. of his time at hand composition and distribution. He shall be given opportunity to set reprint ads and job work.

In the third year an apprentice shall be employed at least seventy-five per cent. of his time on the floor at hand composition and distribution. He shall be given opportunity to set ads and job work from manuscript, and assist on make-up and imposition. All apprentices shall serve a term of not less than three (3) nor more than six (6) months of the third year as copy-holder and assistant proofreader, but shall not do first reading.

In the fourth year an apprentice shall be employed at least **seven hours each day** at hand composition, distribution, make-up, and stone work.

In the fifth year an apprentice shall be employed his full time at floor work, and during the last three months may be allowed to set live matter on machine. He shall receive the following scale:

In effect January 1, 1916, to January 1, 1918:

For first 3 months	\$16.50
For second 3 months	18.50
For third 3 months	20.50
For last 3 months	22.50

In effect January 1, 1918, to October 1, 1919:

For first 3 months	\$17.50
For second 3 months	19.50
For third 3 months	21.50
For last 3 months	23.50

The ratio of one to eight shall be maintained for all shifts and overtime.

Apprentices shall be registered on the books of the Union and shall at all times be under the direction of the foreman and supervision of the chairman in regard to carrying out these rules.

All apprentices when registered shall be between 16 and 21 years of age.

* * *

No apprentice may leave one office and enter the service of another employer without the written consent of his first employer, endorsed by the President of Typographical Union No. 6. When an apprentice is discharged the foreman shall at once notify the chairman of such fact, who shall investigate the cause of discharge, and if, in his opinion, the discharge is not for good and sufficient reasons he shall so report to an officer of the union.

A form of indenture shall be prepared, to be approved by the employer and Typographical Union No. 6, for the signature of each apprentice registered in offices.

Any apprentice who wilfully neglects the duties which he is required to attend to under these rules may be brought up and disciplined by the Discipline Committee of the Union.

These rules shall be posted conspicuously in all offices.

In commercial shops a five-year apprenticeship, following the rules agreed to between employers and unions, will produce a fairly good compositor, but every shop lacks something toward turning out a fully competent, capable mechanic. There are large shops devoted wholly to magazines and trade papers where the work is of a routine nature, performed on a time schedule, and with very little variety. The shops that do book and job work are almost ideal places in which to train apprentices, since the diversity of work brings them in touch with every important phase of composing room operation. The apprentice handles machine and hand composition, display for advertisements and job

work, makeup, stonework and machine composition, has proof-room practice and gains a general idea of what photo-engraving, electrotyping and bookbinding contribute to the industry.

Another type of shop is the small job office with only platen presses, the largest of which can print a sheet 17 x 23 inches. Here the apprentice may handle machine type set by a trade composition house. He does not see a typesetting machine in operation and fails to grasp its possibilities. He obtains no instruction in imposition of cylinder press forms and in making up large pages. In the great number of small printing offices, boys are working at typesetting. In some small shops no systematic effort is made to teach these boys the trade—they pick up whatever knowledge they can and seldom become competent printers. It is obvious that a boy can never be graduated as a well-trained journeyman from an office where the character of the work is commonplace and the equipment poor. Many of these boys leave the trade, as they see no future for themselves after a few years in the small shops. Some continue and find employment as “two-thirders,” and a few eventually get into large offices and develop into good printers. Boys in the small shops receive from \$5 to \$9 per week, “two-thirders” from \$10 to \$18. If a boy has a common school education he can begin as a printer’s apprentice, but to advance he must give some time to the study of spelling, grammar, punctuation, capitalization and syllabication. It is possible to become an acceptable typesetter without special study. The mere process of correcting the galleys, noting and remembering the errors made, will in time make a boy useful, but his usefulness and opportunities for steady employment will be enhanced if he enters apprenticeship well grounded in the English language or attends continuation or evening classes during his apprenticeship period. Arithmetical knowledge is also very important for him. In the composing room there are calculations and measurements to be figured. The setting of the stick, the measurement of type pages, the calculation of matter on galleys, the imposition of forms, the cutting of paper, the casting up of tables, the various kinds of mathematical matter occurring in copy, all require a knowledge of arithmetic. If the apprentice has given to this branch serious study in school, it will be much easier for him to grasp the many problems coming up in the course of his work.

The composing room graduate makes the ideal executive in

printing establishments and the many calculations that must be worked out in the business office will be easier for one well grounded in fundamental requirements during his apprenticeship. Another reason for efficiency in figuring is that the composing room calculations affecting typesetting call for accuracy. Estimating the amount of matter copy will make; casting off tables to be set; ascertaining areas in triangles, quadrangles, circles, ovals and irregular forms; obtaining margins in imposition, all call for a knowledge of arithmetic that every typesetter should acquire early in his career. Drawing straight lines to square up and register pages in sheets from the press make necessary a knowledge of the elementary principles of drafting and the use of the steel square and the straight edge. A further advance in this field will bring the student to the art of hand lettering, designing and color harmony, all of which have a place in the modern printing establishment. A compositor who can make sketches accurately, indicating the appearance of display matter before setting up, is a valuable asset to every shop. To be able to do hand lettering that can be reproduced by the photoengraver brings a compositor into a field that will easily lead to a better salary and a more desirable place in the trade. Even if a typesetter finds that he has no talent or skill for drawing he should study sufficiently to be able to read sketches, layouts, diagrams and color schemes, as these are a necessary part of his trade equipment.

NEWSPAPER OFFICES

*Seventy-six apprentices were found in a total of 2,227 workers employed in the composing rooms of the newspapers published in English in New York City.

The following rules governing the employment of apprentices have been agreed to between the Newspaper Publishers' Association of New York and Typographical Union No. 6:

In newspaper offices, declared as such by the Union, apprentices may be employed in the ratio of one to every twenty men or a majority fraction thereof, but no more than four shall be permitted in any office.

In the first year an apprentice may be required to perform general work in the composing room at the discretion of the foreman.

*As this report was being printed a new agreement was presented to the Newspaper Publishers by the Union seeking the abolition of all apprentices in newspaper offices.

In the second year an apprentice shall be employed at least fifty per cent of his time at hand composition and distribution.

In the third year an apprentice shall be employed at least seventy-five per cent. of his time at hand composition and distribution, and shall receive one-half of the regular scale.

In the fourth year an apprentice shall be employed at least seven hours each day at hand composition and distribution, and shall receive one-half of the regular scale.

In the fifth year an apprentice shall be employed at least seven hours each day at hand composition and distribution, and in machine offices may practice on the machine, and shall receive two-thirds of the regular scale.

Apprentices shall be registered on the books of the Union and shall at all times be under the supervision of the chairman.

All registered apprentices shall be between the ages of sixteen and twenty-one.

Apprentices shall be prohibited from working overtime or more than six days in any one week.

On the completion of the term of service of an apprentice and his admission into the Union he shall be placed at the bottom of the priority list in the office in which he is working. * * *

In newspaper offices an apprentice cannot obtain the training to fit him for competency in a commercial shop. The newspaper composing room must meet editions promptly, and workmanship must often be sacrificed for speed. An apprentice trained where the details of good typesetting are secondary to speed is likely to form habits that need correcting and this has been recognized by the trade, first by limiting the number of apprentices in newspaper composing rooms to four, and second, by insisting on their attendance to the Hudson Guild School for Printers' Apprentices. A newspaper apprentice can learn sufficient in five years to make him a useful employee in the particular office where he is employed, but unless he receives instruction in display, job work, book and magazine makeup and imposition, he will not be a competent all-around compositor.

NEED FOR OUTSIDE TRAINING

Each type of shop mentioned, except the book and job office, lacks some essential to turn out a finished typesetter. Thus, many apprentices on becoming journeymen carry a handicap that hinders them from attaining higher wages and better positions.

The trade is cognizant of its shortcomings regarding apprentice training, and the organized portion of it has, in a measure, sought to improve the opportunities of its apprentices to obtain outside instruction in the things that the shop fails to give. Em-

employers' associations and labor organizations co-operate in the work of the Hudson Guild School for Printers' Apprentices, and the West Side Y. M. C. A. School is maintained by employers. Details concerning these institutions will be found elsewhere in this report. These schools, however, do not touch all branches of the industry and are not equipped to meet fully the demands of the trade.

BOYS AND HELPERS

In every printing office there is much work that boys can perform. These are usually engaged as errand boys and are put to such work as delivering packages, putting away material, such as leads, galleys, rules and furniture; running proof presses, sweeping and cleaning and holding copy for proofreaders (except in newspaper offices). These boys are usually 16 years of age, but some may be but 14 or 15 years old, to whom the health authorities have issued working papers. They are usually advanced to apprenticeship in the mechanical department.

Helpers in composing rooms work around the linotype machines and in the monotype casting rooms. They carry metal, keep the metal pots filled, keep the machines clean and are generally useful in the machine department. In the monotype casting room they watch the casting operation, remove the type galleys when filled and serve as general assistants to the machinists. While they acquire knowledge of the machines and are useful workers, their occupation is regarded as a "blind alley" job. To become machinists on either linotype or monotype machines, an apprenticeship at the machinist's trade is necessary, as well as special courses in the factories where composing room machinery is built. Helpers who are engaged without special technical training seldom advance beyond the stage of simple tasks. They are generally young men between the ages of 18 and 25 years of age, although some are older. Their wages range from \$9 to \$15 per week. Ability to read and write simple English is the only education required for the job. Dexterity in handling material is all the skill that is required.

WOMEN IN COMPOSING ROOMS

Many women find employment in composing rooms as machine operators and in the proofrooms. That they are received in the

union on an equal footing with men is shown by the following extract from the Book of Laws of the International Typographical Union:

"Equal wages and conditions shall prevail for both sexes in every local jurisdiction of the International Typographical Union, subject to the requirements of the laws of the various states, as these laws affect women workers. Any member who violates the provision of this section, upon conviction, shall be punished by a fine of not less than \$25 or suspended, as the union may determine, in accordance with International Law."

Women make efficient keyboard operators, developing speed equal to the best male workers. There are at present more monotype than linotype operators among women composing room employees.

In the proofrooms women, who have had composing room training, find employment for which they are well adapted, and many have risen to well paid positions as copy readers and expert indexers.

A recent act of the New York Legislature forbids the employment of women after 10 o'clock at night. This has deprived many women printers of situations on morning newspapers, and some who could not transfer to the day shift were forced to seek work in commercial shops in which wages are lower.

There are about 1,000 women employed in the composing rooms in New York City. About a quarter of this number are members of the Union and receive the regular scale of wage. About two-thirds of the women engaged in composing rooms are machine operators and about one-third proofreaders.

CIRCUIT MACHINISTS

In some 50 trade composition shops in the city with equipments of from one to fifteen machines, a breakdown occurs occasionally, calling for the services of an expert typesetting machinist. Many of the shops are too small to employ a machinist regularly and depend on what is known as a circuit machinist to make their repairs. There are several circuit machinists in New York who have built up a lucrative trade attending to the repairs of typesetting machines in small shops. These men are familiar with every detail of the work and make needed repairs quickly and thoroughly.

SUBDIVISION OF COMPOSING ROOM WORK

In the early days of printing the term printer meant a craftsman who could perform all of the operations necessary to produce a finished book. In Gutenberg's time the printer built the press, cast the type, made the ink and inking pads, set the type, printed the sheets, and finally bound the book. In Franklin's day some changes had occurred. The printer of that day could buy presses, type and ink, but he still cast his rollers, set type, ran the press and bound the printed sheets.

Somewhat later, about 1800, roller making and bookbinding became separate industries. In the printing office itself there occurred a division into composing room and pressroom. In the composing room compositors came gradually to specialize as straight matter hands, jobbers, stonehands and proofreaders. When machinery was introduced a further division of labor took place, and linotype and monotype operators, and machinists were added. In large modern composing rooms men are kept at special tasks for long periods. They became experts at certain kinds of work and are valuable financial assets to the office on that account. For this reason they are kept at their special tasks and each special operation is almost a trade in itself.

TRAINING FOR THE COMPOSING ROOM WORKER

There are forces at work seeking to bring about a broader training for the composing room worker, but much remains to be done. Specialization is necessary and inevitable, but it is also detrimental in a degree to the chances for the worker, as a man is often held in one shop, fearing to change, because he lacks training in many of the things that would enable him to do the work of an all-round mechanic.

In the following pages an effort has been made to cover what the worker in the composing room does, the knowledge necessary for the routine performance of his task and that needed for full comprehension of his work.

HANDMAN

The handman reads copy and assembles type by hand, including straight composition, tables and display. To do this, he sets the composing stick to measure, picks up type from the case, jus-

tifies and spaces it in the stick and transfers each stickful to galley (when typesetting machines are employed this process is done by the machine.) He corrects the type in the galleys and pages according to proofreader's marks, makes up pages (see makeup), arranges same (imposes) and locks up forms for the foundry or presses, putting in furniture and making margins according to sizes required. (See stonehand.) He should be able to perform various unclassified duties, such as distributing type, cutting leads and rules, and "pulling" proofs by hand or on proof presses.

The handman needs facility in interpreting copy that is badly written, in correcting errors which have crept into the manuscript and in setting copy in which spelling and punctuation are faulty. He must possess skill in setting, making up and distributing type, and have the ability to memorize sections of copy.

The handman should have the training indicated for an apprentice. His knowledge of mathematics should enable him to read mathematical signs, common fractions, decimals and Roman numbers, when occurring in copy. He should know the printers' point system; be familiar with the foot rule and steel square; read proofreaders' marks; interpret sketches, layouts and diagrams.

His knowledge of mathematics should be sufficient to enable him to make the calculations necessary for tabular work and to figure margins and space in locking up pages for press and foundry. As suggested under apprentice training advancement in the printing trade is dependent largely upon mental growth and broad acquaintance with the terminology and good usage in general and special literature. This breadth of information is particularly needed by the expert handman. The handman should endeavor to cultivate a feeling for proportion, and balance in type arrangement so as to obtain the best effect from display work. Any latent artistic talents should be developed along the line of hand lettering, decorative designing, and color harmony. The handling of type gives the handman a knowledge of letter forms that usually require close study by letter draftsmen who are not printers. It is an easy step from hand lettering to other decorative schemes used in printing and many successful printer artists are graduates of the composing room. It is also from among handman that composing room executives are usually chosen, as the best general knowledge of composing room work is obtained by the men employed in the hand department.

LINOTYPE AND INTERTYPE OPERATORS

(MEN AND WOMEN)

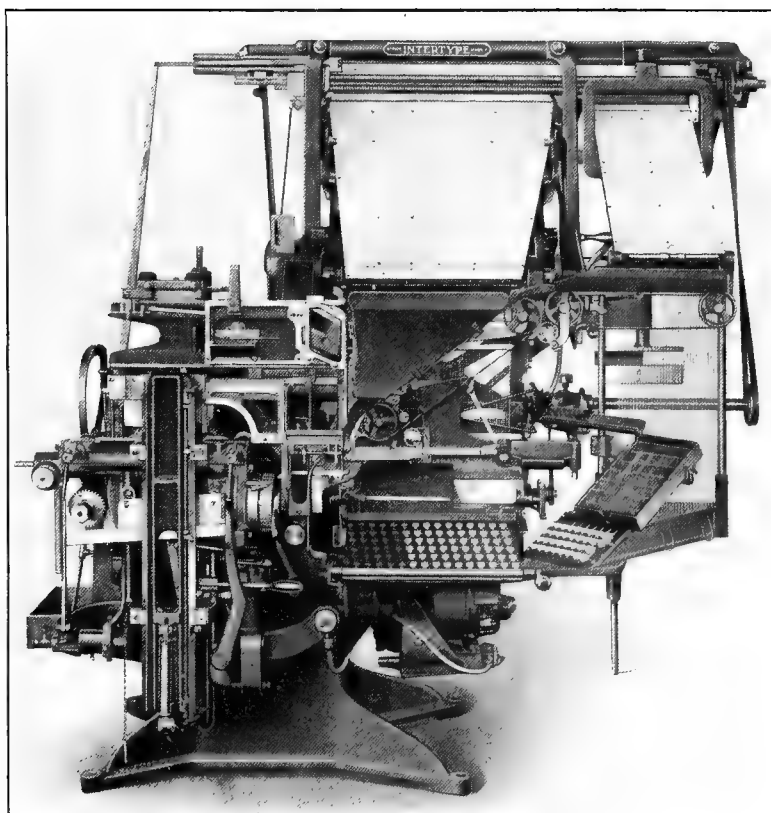
Linotype and intertype operators work on keyboard machines that cast slugs of various measures and sizes of type. By touching keys on a keyboard matrices (letter moulds) and space bands, (for spaces between words) are assembled. By throwing down a lever the assembled line is sent to a casting device, which automatically casts the line, after which the matrices are automatically returned to their proper channels in the magazine and space-bands to their holder. The feeding of the metal pot (unless self-feeders are attached) and the emptying of the galley which receives the lines, must be performed by hand. The operator must be able to read all kinds of copy, to memorize sections of the same, and give it proper interpretation as regards spelling and punctuation. He should possess accuracy and speed in manipulation of keyboard, which he should be able to operate by the touch system. The operator puts his individual "slug" at the head of his "take" or galley to indicate matter set by him. He also keeps the metal pot filled.

The operator should have the training indicated for the apprentice, and in addition should understand the mechanism of the machine, so that in an emergency he would be able to make minor repairs.

As in the case of the handman the operator should devote much of his leisure to the study of literature, newspapers, public documents and printing trade papers to familiarize himself with names of persons, places and events, as these things are constantly occurring in copy passing through his hands. Beside the special skill required the greatest need of the machine operator is the breadth of training represented by the superior hand compositor, and this is not always found among machine workers.

LINOTYPE AND INTERTYPE MACHINISTS

Linotype machinists are employed in plants where the number of machines used is sufficient to justify the employment of a man whose sole duty is to keep the machines in repair. Usually, plants of more than four machines employ one or more machinists. The machinist makes repairs and adjusts and supervises the machines to see that they are running properly; sees that the temperature



INTERTYPE TYPESETTING MACHINE

of metal is correct and tests it mechanically to determine if alloy is in proper proportion. He changes matrix magazines, repairs matrices and spacebands; and supervises the remelting of metal.

He must be able to clean and refit gas and electric burners, clean, repair, adjust and oil working parts of the machine, such as cams, delivery slide levers, pumps, distributor mechanism, driving and intermediate shafts, clutch, keyboards and magazines. He adjusts the metal pot and plunger, the spacebands, vise, knife wiper, ejector slide, elevator, matrix transfer, spaceband levers and pawls, mold discs and slide, mold driving mechanism, start-and stopping device, etc.

The linotype machinist needs a common school education and should be an all-around machinist on small work. He must understand the mechanism of the machine; know the printers' point system; be an expert in micrometer reading, and be able to interpret diagrams relating to machinery.

Most machinists have at some time worked in the factories where the machines are built, and these factories are always open to them for the study of new machines, devices and parts as they are introduced.

MONOTYPE OPERATORS

(MEN AND WOMEN)

The monotype casts movable type, and consists of two separate machines—keyboard and caster. The monotype keyboard operator strikes a key, which perforates a paper ribbon carried on the keyboard. The position of these perforations upon the paper ribbon determines the letter the casting machine will make, just as perforations in a roll of music for a mechanical player determine the notes the piano will play. As the operator thus sets the copy at the keyboard, the ribbon is wound on a spool, which is transferred from the keyboard to the casting machine whenever it is desired.

The monotype casting machine is a complete type foundry which, when controlled by the paper ribbon, casts type set up, ready to print from, in automatically justified lines. This matter is cast with low quads and spaces if the work is to be printed from type, or with high quads and spaces if it is to be electrotyped or stereotyped. It also makes type, rules, leads and slugs for the cases. The operator must care for his keyboard, often,

making minor repairs. He changes the machine for different sizes of type and width of composition. As with the linotype operator, he must develop accuracy and speed in the manipulation of the keyboard with the touch system.

An operator should have the training indicated for an apprentice. In addition he must master the monotype unit system for making calculations. The keyboard operation is different from that of the linotype, in that it resembles the standard typewriter keyboard. He is required to have greater facility in mathematics than the linotype operator, inasmuch as he is called upon to make mathematical calculations in the operation of the drum scale, and in estimating space needed for rules and other material in the completed form. A thorough knowledge of the technique of the compositor's art is essential for the operator, though he does not need the skill of a hand compositor. He must understand the relation of the keyboard to the caster machine, in order to keep the caster going properly when it receives the perforated roll. Moreover, he should know something of the construction of the caster.

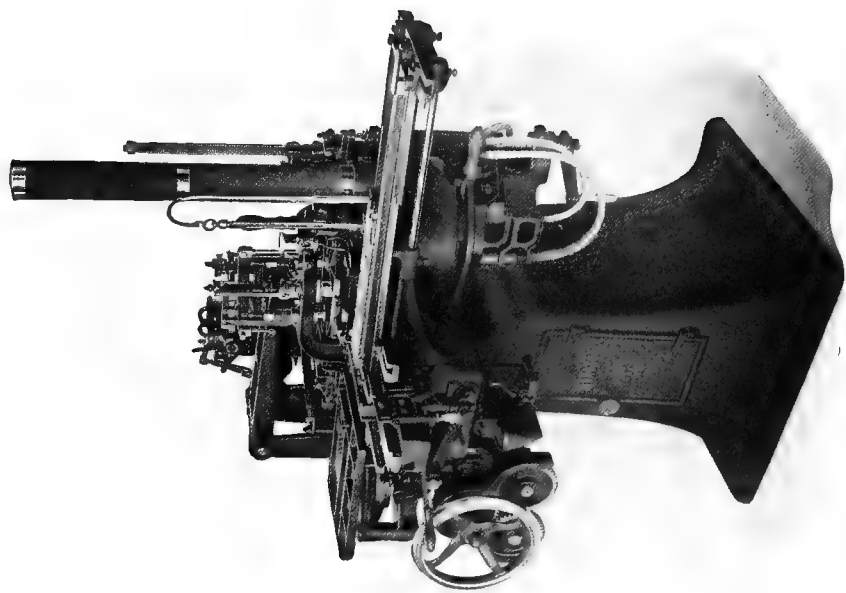
A monotype operator should possess the same general knowledge as indicated under linotype operator, and special knowledge of the mechanism of the monotype keyboard. The peculiar possession of a monotype operator is his thorough acquaintance with his keyboard and the general mechanism of the machine.

MONOTYPE MACHINIST

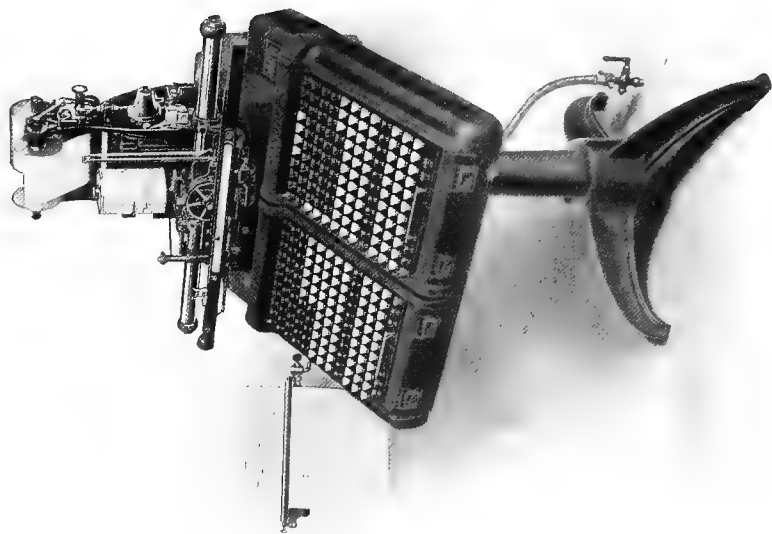
The monotype machinist selects the matrices from which type is cast, adjusts the perforated paper coming from the keyboard machines and supervises the mechanical operation of the machine. He regulates the burners under the metal pots; makes repairs and adjustments to the caster and the keyboard machines, tests metal mechanically to see that the alloy is in proper proportion, tests type measurements, and usually has charge of the storage of matrices and type sorts.

The monotype machinist should have the same general qualifications as the linotype machinist. In addition he must understand the mechanism of the monotype machine and comprehend fully the monotype unit system and gauges.

The monotype factories in Philadelphia and Boston furnish the schools from which these machinists graduate.



MONOTYPE CASTER



MONOTYPE KEYBOARD

MACHINIST OPERATORS

Printers who have sufficient knowledge of the mechanism of the linotype, intertype and monotype machines to perform both the functions of a typesetter and a machinist are found in small plants.

MAKE-UP MAN

A make-up man is a handman, or operator, employed at making up pages. In a commercial shop this task consists of dividing type on galleys into pages, inserting rules, cuts, running titles, and marginal and foot notes. When pages are spaced into equal lengths they are tied up. They are then ready to submit to the author, or to be printed.

The educational and other qualifications, wages and opportunities are the same as for handmen.

A newspaper make-up man requires all the knowledge of a handman. He assembles type for publication into pages, under the supervision of an editor, and locks up the forms for the stereotypers. Speed and accuracy are the principal requirements of a make-up man, and this work is usually performed by men with long experience in the newspaper composing rooms.

PROOFREADER

The proofreader compares proofs with copy, and indicates errors in type, English and office style. He queries author's possible errors, revises the second proofs and passes (O. K.'s) pages and sheets for the foundry and presses.

The proofreader must have a well-grounded knowledge of English usage, especially as relates to grammar, spelling, punctuation and syllabication. He must know the conventional proofreader's marks. The union rules require that the proofreader shall have served the regular apprenticeship for compositors or machine operators.

A wide acquaintance with general topics, such as literature, the arts and sciences, politics, business and sports, together with a knowledge of scientific mathematical and technical symbols, are very desirable qualifications. A proofreader cannot be too well read. An acquaintance with one or more foreign languages,

geography, and a knowledge of the resources and history of the principal countries of the world, are valuable assets, especially in the newspaper office.

Proofreaders usually develop from among the most intelligent of composing room employees and are generally older in years than the average worker. Men and women from 25 to 70 are engaged in this line of work.

STONEHAND

The stonehand lays type pages and plates on the flat imposing stone, or on patent blocks, according to a standard imposition, or one furnished by a bookbinder. He places proper furniture between pages and margins, as various sizes of pages or paper require, squares and lines up pages in chases and locks the forms for press. He also makes the final corrections and registers the pages after the pressman has adjusted the guides on the press.

The educational and other qualifications are the same as for the handman.

The stonehand should be familiar with sizes, weights and qualities of papers, the standard hand and machine folds, the sizes of beds and speeds of presses in the plant where he is employed. He should be conversant with various arrangements of layouts in order to secure the most economical results in the use of paper or the number of impressions on the press.

Stonework is the hardest manual labor in a composing room. Stonehands are usually the older journeymen between the ages of 30 and 60 years. They easily command more than the minimum wages. All executives must have a thorough knowledge of stonework as the appearance of a finished book is dependent on proper imposition and registering of forms.

COPYHOLDER

(BOYS AND GIRLS)

A copyholder, when not a regular apprentice, is usually a boy or girl 16 years of age, or over. The copyholder follows the reading of the proofreader, calling attention to the departures from copy, or reads to the proofreader.

Clear enunciation, proper pronunciation, and a fair knowledge of English usage are essential.

A copyholder has no future in the trade unless he or she can become an apprentice in the composing room, and eventually develop into a proofreader. In itself it is a "blind alley" job.

COPYCUTTER

(NEWSPAPER)

A copycutter receives copy from news, editorial and advertising departments, cuts it into "takes" (sections), and numbers them for distribution to typesetters. He judges and allots these "takes" so that the typesetters on a particular piece of work will all finish as nearly at the same time as possible. A newspaper copycutter requires all the knowledge of a handman, and should be familiar with machine operation. Copycutters are selected from among the men with long experience in newspaper work.

BANKMAN

(NEWSPAPER)

The bank is an inclined table divided into long galley-like sections where operators deposit their "takes" when set. The bankman puts the "takes" in their proper order, places them on a galley, numbers them, and turns them over to the proofpress operator, or proves them himself. Usually two first proofs are taken; one to send to the proofroom to be read, the other to be filed for the use of the foreman to ascertain the amount of type each operator has set. When the proof is corrected the operator's number slug is removed and the matter closed up in continuous story form and is ready then for the editor's revision and correction, if required.

FOREMAN AND SUPERINTENDENT

Composing room foremen and superintendents should have a thorough understanding of the mechanical processes of hand work and machine operating; be familiar with the details of photo-engraving, stereotyping, electrotyping, presswork, and bookbinding; have a sufficient knowledge concerning ink, paper, printing material, tools, equipment and accessories to secure best results

and possess the requisite executive ability to effectively direct the work of the employees. They are usually men of long experience in the trade. Good salaries, ranging from \$30 to as high as \$150 per week are easily commanded by competent men.

THE PRESSROOM

MECHANICAL DEVELOPMENT IN THE PRESSROOM

In the installation of the most modern machines and devices making for greater economy and efficiency, the pressroom has been surpassed by no other department. Automatic feeders, automatic presses, pile deliveries, mechanical overlays, improved processes of printing and make ready, and presses built for greater production and speed are being constantly developed. Supply men, chemists and inventors are constantly bringing into the pressroom newer, in some cases, revolutionary methods, to bring about increased and better output at the same, or lower cost.

TYPES OF PRESSES

There are three types of presses now running in the pressrooms of New York City; platen, cylinder and rotary.

In the platen press the form and the platen (impression surface) are both flat, and the printing is done by bringing both surfaces together under pressure.

A cylinder press (sometimes known as a flat bed press) is one in which the bed carrying the form is flat and passes back and forth beneath a cylinder (known as the impression cylinder) that rotates at constant speed. The printing is done when the medium which is to be printed upon passes between the form and the cylinder.

A rotary press consists of two cylinders, the plate cylinder and the impression cylinder, and the printing is done by passing the material to be printed between these two cylinders.

A perfecting press is a press that prints both sides of the sheet before delivering it. What is known as a web-press is a press that is fed by paper in roll form, and as the press is printing, the paper feeds continuously from the roll. There are two kinds of web presses, cylinder and rotary. As a general rule, however, when a web-printing press is spoken of it means a web rotary perfecting press.

SPEED OF PRESSES CONTINUES TO INCREASE

Manufacturers continue to make improvements upon presses which, from a mechanical viewpoint, seem already perfect. The demand for greater production and finer kinds of work constantly stimulates the effort towards improvement. Machines which are popular today may be obsolete ten years from now. The crying demand is for speed. The class of work which is being done today seemed almost impossible a few years ago. For example, one press has been developed which prints four colors, using four plate cylinders and only one impression cylinder.

The rotary web perfecting presses are constantly gaining in favor. They are turning out a high grade of work at far greater speed than the cylinder presses and most of the magazine and book work of the city is being printed upon them. It is only a question of time, in the judgment of the printing authorities consulted, when the web presses will be used for much of the work now accomplished by cylinder presses.

The largest press built is a double octuple press, having eight pairs of cylinders. The press consists of two separate octuple presses that can be coupled together, if the size of the sheet to be produced requires it. The builders of this press claim it can run 32-page papers at the rate of 75,000 per hour.

The press that has been most successful as a producer, in the newspaper pressrooms of New York, is one consisting of three pairs of cylinders, known as a sextuple press. It is fed by three rolls of paper, each four newspaper pages wide. This press produces 96,000 12-page papers, or 48,000 24-page papers, per hour. Before 1917 the highest production ever attained by any press of the same number of cylinders was 70,000 12-page papers, or 35,000 24-page papers.

One trouble the press builders are beginning to meet is due to the great speed at which the presses are being run. The composition of which the rollers are made does not always stand the considerable centrifugal force to which they are subjected, and pieces of roller composition become detached and fly off as the press is running. It will be interesting to know just when, and at what rate of speed, the press builders will declare they have reached a point of maximum efficiency.

The machine and automatic devices now being introduced are far more complicated, and require more delicate handling and adjustment than those of the past. This necessitates more highly

trained pressmen, in fact, calls for a trained mechanic, competent to deal intelligently with the complicated and costly machinery placed in his care.

METHODS OF PRINTING

There are three methods of printing—relief, intaglio and planographic. In the first two processes the printing is accomplished because of the printing surface being either raised in relief above the rest of the plate, or etched below the surface. In the planographic process known as the offset process, the printing surface is in the same plane as the surrounding surface of the plate. In the first two processes printing is made possible by difference in position: in the last by difference of condition. The relief and intaglio processes are purely mechanical processes, but the offset is a chemical as well as a mechanical process.

The relief method is represented by printing from type, line cuts and halftones, either directly or in the form of stereotypes or electrotypes. The ink is deposited by rollers upon the raised surface of the form, and the medium to be printed upon is impressed upon this surface.

The intaglio process of printing is known as "Gravure," "Rotogravure," "Rotarygravure" and "Photogravure." The first and last names are mostly used when speaking of work printed from flat plates, but all four names are proper when the printing is done from etched cylinders in a web press.

In rotary web presses the cylinder, upon which the design or work is etched, is a steel drum with a facing or jacket of copper. This cylinder revolves through an ink fountain and comes out dripping with ink. A steel blade known as the doctor blade oscillates across the surface of the cylinder, scraping away all superfluous ink from the surface and leaving the ink only in the depressions of the cylinder. The paper passes between the copper etched cylinder and the impression cylinder which consists of medium hard rubber. The impression cylinder tends to force the paper into the depressions causing the ink to be deposited upon the paper.

Because of the varying depths of the etched depressions, different thicknesses of ink are deposited on the different tones. This causes some difficulty in the matter of drying the ink deposited upon the solid tones. In order to accelerate the drying, the sheet

is run over a steam cylinder. New presses for this process are now being built to run at the rate of 30,000 four page newspapers per hour. These are built after the type of the web rotary perfecting machines.

The planographic method is represented by the so-called offset process in which the printing is performed by a moistened surface of zinc and aluminum either directly or indirectly with the aid of a cylinder carrying a rubber blanket. In this method the desired printing pattern, whether of type or cuts, is transferred to a plate through the medium of certain substances which render the surface grease attracting. The spaces untouched by the pattern are grease resisting when moistened by water. The plate is put upon a cylinder and, as the cylinder revolves, it first comes in contact with the water rollers; where the plate is grease attracting, it repels the water, but the rest or blank parts of the plate are dampened. As the cylinder continues to revolve, it comes in contact with the inking rollers. The inking rollers ink the grease attracting part of the plate, but that part of the plate that has been dampened, is now grease repellant and repels the greasy ink. The plate then deposits the ink upon a rubber blanket, which serves as the final printing surface.

The advantages claimed for the offset process is that it needs no make ready on the press and gives good results when printing on rough as well as on calendered stock.

EMPLOYMENT

The conditions of employment in New York, with one or two exceptions, are on a par with the best shop conditions in the country. The pressrooms are well lighted, but in most cases poorly ventilated, due to the fact that for the best results from the inks, there must be no draft, and the temperature of the pressroom must be maintained fairly constant.

The sanitary conditions are looked after by committees appointed by the unions, who co-operate with the employers, with the result that there are very few complaints.

Due to a campaign of education, inaugurated by the International Printing Pressmen's and Assistants' Unions, assisted by the local unions, the death rate from tuberculosis, which was very high in the past, has been greatly reduced. Poorly ventilated pressrooms, paper dust, fumes from ink, metal, and oils, necessi-

tate on the other hand strong lungs for all contemplating entrance to the trade. Danger of being caught in the machinery, or of being cut by the metal plates, resulting with blood poisoning, makes it a slightly hazardous trade.

The nature of the work, which involves handling large forms and rollers, requires workers who are strong physically. Good eyesight and hearing are also essential in the pressroom. There is a constant strain on the eyes, and the ability to tell by the sound when the press parts are not running true is very essential.

All the organized shops, and many of the unorganized shops, have an eight-hour day, or 48 hours a week. The work is fairly constant all the year round, with the exception that it drops off a little during the summer months.

The trade, as regards the number of workers, is virtually at a standstill. In the job shops automatic presses with greatly increased output are being installed, and in consequence the volume of work produced is greater, but the number of positions either remains the same or is decreasing. As these automatic presses can do the work of two or three ordinary job presses, they effect a large saving in floor space. Automatic feeders are also eliminating job press feeders.

In the commercial shops web presses are fast supplanting the cylinder presses. All of the book magazines are being printed on web presses. There is one publication in New York that formerly required 90 odd cylinder presses to turn out work now being done by eight web presses. This, of course, decreases the number of positions for pressmen and their assistants. Automatic feeders are also being placed on all cylinder presses, thereby decreasing the number of cylinder feeders.

In the daily newspaper offices, as the circulations of the several papers increase, higher speed machines are installed which increase the output, but do not effect the number of positions.

HOW PRESSROOM WORKERS ARE TRAINED

NO DEFINITE TRAINING FOR APPRENTICES

The fact that the conditions in the modern pressroom require the services of two or more feeders to one pressman, makes it impossible to give the boy who enters a pressroom any definite assurance as to the training he will receive. As a matter of fact many men spend fifteen or twenty years in the pressroom before

they become pressmen and, in some cases, they never reach this position, but remain as feeders, or assistants. The chances for promotion in this branch of the trade are slight, but the wages paid to the feeders and assistants seem to be high enough to attract sufficient numbers to supply the demand.

The boy who wishes to become a pressman may enter either a newspaper office as a flyboy, or a commercial, or job shop as a feeder. The training, character of work and opportunity for advancement in the two types of offices differ.

NEWSPAPER OFFICES

As a rule, the boy who enters the newspaper pressroom serves five years as a flyboy before he is registered as an apprentice. However, if there is a vacancy among the apprentices and there are no flyboys who have served five years, the boy who has served the longest period is promoted. The apprentice must serve three years before he is eligible for the position as pressman on a newspaper press. The fact that he has served five years as a flyboy and three years more as an apprentice is no guarantee that he will become a journeyman at the end of that period. He must wait for promotion until there is a vacancy among the pressmen, or until there is a new position created as a result of an increase in the volume of business.

Since the newspaper pressrooms in New York City are almost entirely manned by union workers, the union records give an accurate picture of the training of the pressroom worker. According to these records there are about 336 flyboys and 100 pressroom apprentices. During the last three years an average of twenty apprentices were made pressmen each year, making room for a corresponding number of flyboys to become apprentices. During the same period an average of thirty flyboys were taken on each year, in order to fill the vacancies caused by the promotion of flyboys to apprentices, and by the dropping out of those who became discouraged.

Nearly all the boys who enter the pressroom are eighteen years of age and are physically strong. They are paid from \$12 to \$15.50 a week during the eight years they serve as flyboys and apprentices. The maximum number of apprentices allowed in any newspaper office is five. No systematic instruction is given them in the newspaper pressroom and any knowledge which they

acquire must be picked up. In an attempt to remedy this defect, the Newspaper Pressman's Union has recently organized a class in the theory of presswork for the flyboys, apprentices and pressmen in newspaper offices.

After a boy becomes a pressman he may, after a number of years, become a pressman in charge. In the newspaper pressrooms there is a pressman in charge for each machine. The chance to gain promotion to this position is about one to five, as there are usually five pressmen for each pressman in charge.

COMMERCIAL SHOPS

In commercial shops having both job and cylinder presses, the boy who desires to become a pressman has to enter as a job press feeder. In shops with only cylinder presses or cylinder and web presses, the boy begins as feeder on a cylinder press. There is no definite period of training in the commercial pressrooms and a boy may work there all his life and yet never become a pressman.

If a boy enters the trade as a job press feeder, his chance for advancement is very slight, as only a small per cent of the job press feeders are promoted. A study of the records of Job Press Feeders Union No. 1, reveals the fact that during the year 1916, out of 546 members only twelve became job pressmen, and thirty-six became cylinder press feeders. The previous year, out of a membership of 460 feeders only two became job pressmen and twenty-five became cylinder press feeders. Many of these boys, after remaining at this work five or six years, become discouraged and go into other occupations. During the past year ninety-four (dropped out) from the union, eighty of whom entered other occupations. The following table compiled from the records of the above organization gives certain data as to the number of union job press feeders, number taken, number suspended, etc., during the past three years:

	1914	1915	1916
Number in Union	378	460	546
Number promoted to Job Pressmen.....	2	2	12
Number promoted to Cylinder Feeder.....	21	25	36
Number of withdrawals	9	1	27
Number suspended	14	41	67
Number new members	95	113	238

The job press feeders in the Union are from sixteen to twenty-five years of age. They receive a salary of \$12.50 a week.

It is estimated that there are about 1,500 job press feeders in non-union shops. The opportunity for advancement seems very small, partly for the reason that a large percentage of the shops are equipped only with platen presses.

In union shops, cylinder press feeders are not considered apprentices. When a feeder is made an apprentice he is taken from the feeding board and put on the floor to assist the pressman, and must serve four years in this position before he becomes a journeyman. In some shops, when a cylinder feeder is made an apprentice to the cylinder pressman, a job press feeder is made an apprentice to a cylinder press feeder and serves four years in this capacity before he becomes a cylinder press feeder. Only one apprentice is allowed for every four cylinder pressmen and no chapel or shop is allowed more than five apprentices. A large percentage of the cylinder press feeders and apprentices come from the ranks of the job press feeders. Many of these men work as cylinder press feeders for years before they become cylinder press apprentices.

The cylinder press feeder may become an assistant on the book and magazine web press, but if he does he can never become a book and magazine web pressman unless he returns to the cylinder press and spends four years as an apprentice. This is due to the rule that all book and magazine web pressmen must come from the ranks of the cylinder pressmen. As a result of this rule very few cylinder pressmen ever have experience on the book and magazine web press before they become pressmen in charge of this type of press. The assistant on the book and magazine web press is the only person who is trained in the care and operation of the machine under the direction of a pressman, and he is not allowed to become a pressman on this press unless he returns to the cylinder press, as a feeder or apprentice, and waits until there is an opportunity for him to become a cylinder pressman.

As a result of the above mentioned rule, and the fact that present conditions in the modern pressroom require the services of two or more feeders to one pressman, the opportunity for promotion for the feeder is not very promising. The cylinder feeders in union shops are paid \$18.00 a week, and this wage in the past has been sufficient to secure the requisite number of workers. The records of the Franklin Cylinder Pressfeeders' Union No. 23, show that during the year 1916, forty-nine men out of a membership of 2,540 were promoted to the position of pressmen. During

the previous year, twenty-eight men out of 2,325 were promoted to the same position. These figures show that less than 2 per cent. are promoted annually.

The following data was compiled from the records of the above union :

	1914	1915	1916
No. in Union	2200	2325	2540
No. promoted to Cylinder Pressmen	42	28	49
Withdrawals	50	54	70
Traveling Cards issued	58	60	64
Travelers received	..	..	60
Deaths	24	25	28

WEEKLY WAGES OF COMMERCIAL AND NEWSPAPER PRESSROOM WORKERS

Kind of Work	Day		Night	
	Union	Non-Union	Union	Non-Union
Commercial Shop:				
Job Press				
Feeder	\$12.50—	\$7—\$12.50	\$15—	\$7—\$15.00
Cylinder				
Feeder	\$18.00—	\$7—\$18.00	\$20—	\$7—\$20.00
Web Press				
Assistant	\$19.00—\$22.00	\$15—\$22.00	\$20—\$23.00	\$15—\$23.00
Job Pressman...	\$20.00—\$27.00	\$12—\$20.00	\$22—\$29.00	\$13—\$29.00
Cylinder				
Pressman	\$26.00—\$28.00	\$18—\$26.00	\$28—\$30.00	\$18—\$30.00
Cylinder Press-				
man (on color)	\$28.00—\$36.00	\$20—\$36.00	\$30—\$38.00	\$20—\$38.00
Book and				
Magazine	\$33.00—\$37.00	\$25—\$37.00	\$35—\$37.50	\$25—\$37.50
Newspaper Offices:				
Flyboy	\$12.00—\$15.00		\$12—\$15.50	
Pressman	\$27.00		\$28	
Pressman in				
charge	\$33.00		\$34	

The wages paid pressroom workers in New York City are somewhat lower than those paid to the composing room employees. The figures shown in this table for the union shop employee represent the wages provided for in the scale and are the wages commonly paid, although a small per cent of the men receive wages above the scale. Where two figures are given the

larger represents the wage paid for operating more than one press or certain types of presses. The newspaper pressrooms are 98 per cent organized and all the newspaper pressmen receive the union scale of wages.

The chart also shows the minimum and maximum wages paid in the non-union shops. The information concerning the wages paid non-union workers was collected by the members of the survey staff and the figures checked by the conference committee appointed by the printing trade organization. A small per cent of the employers of the non-union workers pay the union scale of wages, but as a rule the average wage paid in the non-union shops is much lower than the wage paid in the union shops.

NEWSPAPER PRESSROOMS

In the newspaper offices the conditions of employment are somewhat different from those found in the commercial shops. Here the types of presses are uniform in each office. The work is heavy and the demand that editions be out on the street as quickly as possible necessitates constant hustle and rush and requires the pressroom worker to be quick and strong.

The pressman in charge must thoroughly understand the machine he has in his care; he must be alert and a quick thinker, able to detect and remedy trouble instantly.

Some presses have what is called a fudge cylinder; it is a separate unit in itself used to print the summary of a story, or baseball scores, three or four minutes after the story is received at the office. One New York office makes it a practice to sell an edition with the full score of the game to the fans coming out of the Polo Grounds who have just witnessed the game.

The presses in the newspaper offices are the largest built, consisting of thousands of parts and costing thousands of dollars, and it is consequently very essential that the pressman in charge be a very competent mechanic.

The steady force in a newspaper shop is limited to the number of positions required for the smallest sized sheet. There are extra journeymen and flyboys, known as "subs," who report daily at the office, and if the size of the paper to be published that day necessitates extra men, or subs, they are put on for the day. Some of these subs report at one office for years before they are classed as steady men. They are hired according to a priority list estab-

lished in each office. Usually as high as 30 per cent of the force of a newspaper office are on the sub list.

In the following pages an effort has been made to indicate what the pressroom workers do, and in each case the knowledge necessary for the performance and comprehension of the work.

CYLINDER PRESSMAN

The cylinder pressman adjusts the plungers and gibs of the air cushions. The functions of the air cushions and plungers are to overcome the momentum of the bed as it reverses. The power stored up in the air cushion by compressing the air gives impetus to the press bed on its return stroke. The plungers are properly adjusted when the bed moves over the center smoothly. These plungers are changed on their rods when the speed of the press is changed, and here the pressman with a slight knowledge of mechanics goes about his work in an intelligent manner.

He then adjusts the cylinder to the bearers of the bed, which keep the cylinder from riding on the form. These are set by allowing a light to shine through the opening between the cylinder bearers and the bearers of the bed, and gradually setting down the cylinder on the bed bearers by adjusting the impression screws until all light is shut off. When this is done on both sides, a little more pressure is added so that the cylinder will ride snugly on the bed bearers. Another method is to put a piece of thin tissue paper between the bearers and bringing the cylinder down until there is a good "bite" on the paper. The bed bearers should be type high, which is 0.918 inch. A pressman must note the number of threads to the inch of all screw adjustments, in order to know exactly just what change each turn of the screw will make. The gibs are next looked after, and the pressman should know how to adjust them so that they will not bind.

Packing a cylinder is the next step in getting the press in condition, and too much care cannot be taken in this operation. The packing of a cylinder press generally consists of a press-board and a manila sheet, tough but smooth, clamped on one end and wound around the first reel. This manila sheet is shrunk on in most cases by wetting with a sponge and water and letting it dry. On this are placed five or six sheets of calendered stock, termed hangers, and a smooth manila sheet as a top sheet. The completed packing should stand one thin sheet above the cylinder bearers.

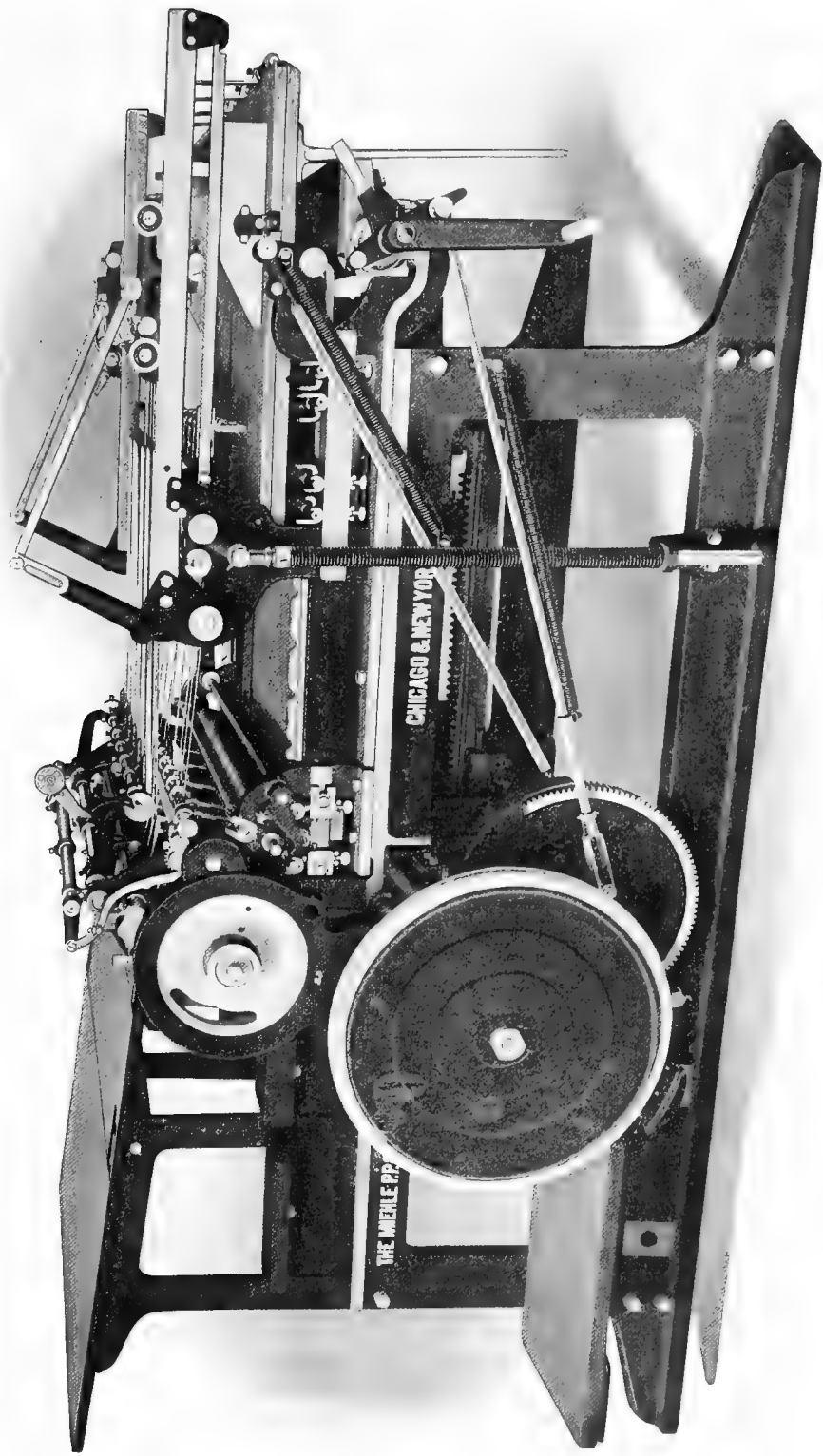
This, as a rule, gives the right impression. A pressman should know how deeply the cylinder is cut below the bearers and with this information to start with he can, with the use of a micrometer, measure his packing for the right thickness. An overpacked cylinder will cause trouble, such as poor register, worn forms, packing pulling from the gripper edge, etc.

To make the cylinder and bed travel in harmony, a segment of a gear is connected to the cylinder, and a gear rack, known as the register rack, is attached to the bed. The pressman should know how to set these in proper mesh so that the bed rack drives the cylinder smoothly. If this rack is not set properly good register is impossible. The function of the register rack is to start the bed and cylinder in harmony at the beginning of the printing stroke.

The form is next put on the press. The pressman should know just how far the form can come to the end of the bed without hitting the grippers when the press starts to print. This can be learned by pasting a sheet of paper over the top sheet and pulling an impression on it, care being taken to open the clamps so they do not batter the form, and also closing the clamps when they clear the form again to prevent hitting the opening tumbler when they come up. If the form is out too far it will show on the sheet, and by this method a line can be found to which the form should be brought. This is generally marked on the bed of the press. The form should be back far enough to clear the fourth form roller when the bed is run back, for if not, this will show a streak on the printed sheet.

In order to lock the form on the press, the pressman must be familiar with all of the furniture used in the composing room, as well as reglets, leads, slugs, and quoins. He should be familiar also with the printer's point system and understand imposition. In tightening a form he must be careful not to spring it, as the form must be flat on the bed. In many of these adjustments there are numerous little tricks that can be picked up only through experience.

The pressman should know how to set the fountain blade, which bears against the steel duct or roller. This blade is pressed upon the roller by screws. Care must be taken not to buckle the blade and the best method is to set the pressure from the center to each end. The more the pressure the less ink can be fed to the roller. The roller feeds forward a fraction of a revolution accord-



A MODERN CYLINDER PRESS

ing to the adjustment of a ratchet at the side. The best practice is to set the ratchet for a considerable movement like five or six teeth and to adjust the fountain blade to allow only a thin film of ink to feed to the roller.

The rollers are set by screw adjustment so as to cause a flat of about one-eighth of an inch. If set down too hard they cause a drag which shows on the plate and sheet. This is due to the fact that the rollers do not travel as fast as they should, due to the decrease of the radius caused by tightening the roller too much.

The grippers are set by putting two sheets under the stop and one under each gripper and then closed hard enough to have a good grip on the paper and so that all pull alike. An uneven gripper affects the register.

The shoeflies which raise the sheet over the strippers are next set. The sheet bands should be set to touch the cylinder lightly and keep the sheet smooth and prevent it from wrinkling. The stop guides should be set to raise just as the grippers close on the sheet. The side guides are set for the size of a sheet and placed to keep the sheet square. The fly fingers, or delivery grippers, are set to deliver the sheets in a straight pile. All these adjustments are important and time must be taken to learn how to make them properly.

At this point the pressman begins the make ready. An impression is pulled to see how the form prints. This impression shows any weak spots in the form or packing and whether the entire form is type high or not. If the form is not type high, he underlays it by placing patches of paper under the form wherever the impression is weak. An underlay is only to bring those parts of the form that are low, type high and not to make up for deficiencies in the packing. A pressman who tries to make up for such deficiencies in this way finds himself in trouble before the run is off the press. In these days when the composing room makes new type for nearly every job very little, if any, underlaying is needed, except for cuts.

If half-tone cuts are in the form, a cut overlay will be necessary. A half-tone cut consists of solids, medium shades and high lights. These high lights consist of fine dots and are in the same plane of the plate as the solid. If the same pressure was put on these dots as on the solids, the dots would soon flatten out, causing the high lights to fill up. The function of the overlay which consists of patches of paper on the impression cylinder, is to give

additional pressure to the darker tones and at the same time easing off on the high lights. The overlay is put upon a shrunk sheet and a hanger dropper. After the overlay is in place, another impression is pulled and the pressman marks out a "spot up sheet," to bring out any weak places in the packing. In this work great care must be taken since too much packing on one spot will have a tendency to bear off on other spots, making them light. As each spot up sheet is added to the impression cylinder, a hanger is taken off. When the impression is satisfactory the press is ready to run.

Considerable time is required to make a hand-cut paper overlay properly and a number of patented overlays have been introduced. One of the most successful of these is known as a chalk overlay. This overlay consists of a special waterproof sheet of paper coated on both sides with chalk. A proof of the form is pulled, with special ink, on this prepared sheet. The sheet is then dipped into a pan containing a lime solution that etches away the chalk that is not protected by ink. The lime solution is kept at a certain constant density to obtain the best results and the pressman tests this solution with a hydrometer. Chalk overlays are being used in a great many pressrooms throughout the city.

All pressmen need to know the qualities of the various inks used and how to reduce them and, except in the case of the roto-gravure pressman, should understand the composition of the rollers and the care necessary to preserve them. All except the newspaper pressman who deals with only one kind should be familiar with the different grades of paper used and their qualities. All should understand the elementary phenomena of static electricity and be able to eliminate its disturbing effects in the pressroom. With the exception of the platen and roto-gravure pressmen they all need to know how to pack the impression cylinders and how to adjust the fountain blade. All except the offset and roto-gravure pressmen must be able to make underlays and overlays and all but the roto-gravure and newspaper pressmen to mix colored inks to match proofs sent from the art room.

Pressmen require little mathematics; all need familiarity with common fractions to 64ths and decimals to the thousandth place and all need sufficient knowledge of mensuration to measure simple plane surfaces, such as squares, and circles in respect to circumference and diameter.

All except the roto-gravure pressmen need to know how to use

the micrometer and all but the offset and newspaper pressmen should be able to read the hydrometer. All should be familiar with the printers' point system, and all should know something of the simple chemistry of inks and paper. All should understand the simple mechanics of liquids and gases as well as the principles involved in the action of cams, levers, screws and gears. Speed and accuracy are required of the pressman in setting cylinders, rollers, guides, stops, fountains, grippers, etc., and facility in handling the micrometer and hydrometer and making measurements accurately.

The temperature of the pressroom should be kept about constant 70 deg. Fah. to 75 deg. Fah. as the atmospheric conditions affect the rollers, ink and paper, causing picking, offset and poor register.

SIGNIFICANCE OF THE OCCUPATION

There are about 2,500 cylinder pressmen in New York City. Of this number about 1,800 are in the pressmen's union. The cylinder pressman's job is important as it is the stepping stone to the higher positions in the pressroom. A cylinder pressman may become a rotary, web, rotogravure or offset pressman in a commercial shop. The number of cylinder pressmen has not increased with the volume of business, as the web press is now doing much of the work previously done by cylinder presses. The cylinder pressman can obtain all of the practical knowledge necessary for this position in the shop, but the technical knowledge needed for full comprehension of the work and for advancement must be secured on the outside.

CYLINDER FEEDER

The cylinder feeder puts rollers into the press and takes them out. He oils and cleans the rollers and press, patches up sheets and helps the pressman make register. He piles paper on the feed board, and combs it down in order to lift one sheet at a time in feeding. He feeds sheets to drop guides and then gently slides them to side guides. He trips the press when he misses a sheet in order to prevent the form from printing on the impression cylinder. He attends to the automatic feeders and helps the pressman in a general way.

In oiling it must be remembered that a new press needs oiling

more often than an old one. Prominent bearings should be watched closely to prevent warming up. In cleaning a press it is necessary for the feeder to acquire the habit of doing the job well. In leaving a press it should be clean enough to run on a color job if necessary. The method generally used to clean a job press is to sprinkle some solvent upon the cylinder or plate and rollers which is then distributed by running the press for a few minutes. The rollers are then removed, and they, as well as all other parts of the press, are wiped clean and dry. When a press feeder leaves his press at night it should be thoroughly clean.

In cleaning the rollers, the feeder should be familiar with their composition so as to know how to protect them from injurious treatment. He must know how to patch up sheets marked out by a pressman, and how to match cut overlays. He should be familiar with the furniture used in a composing room to help the pressman lay the form on the bed of the press, and in making register. Good register depends a great deal upon whether a sheet is fed to the guides properly or not, and considerable skill is required in feeding large sheets. The feeder must be particularly careful in feeding sheets that have been printed on one side to place them on the feed board in the right direction. If the feeder misses a sheet, he trips the press. That is, by the use of a lever worked with his foot, he lifts the cylinder off the form, thereby preventing the form from printing. If he did not do this the form would print on the cylinder packing, and the next few sheets printed would have an offset on the reverse side. The cylinder feeder is sometimes called upon to operate the automatic feeders.

For his immediate work the feeder needs little beyond the requirements as indicated. If, however, he is to prepare for promotion, he must study and equip himself with the knowledge necessary for the pressman.

SIGNIFICANCE OF OCCUPATION

There are about 3,500 cylinder feeders in New York and about 2,000 of these are in the Assistant's Union. The work is fairly constant and the wages high enough to hold most of them in this position. The line of promotion is to assistant on the web press, or to cylinder pressman, but the chances for promotion are slight, as a study of union records shows that less than two per cent are promoted annually. The number of positions are not increasing,

due to the fact that the web press is being introduced to do the work of the cylinder press. The practical knowledge for the work can be secured on the job, but the technical knowledge for a thorough comprehension of the work or for promotion, must be secured from some outside agency.

MAGAZINE OR BOOK WEB PRESSMAN

In getting the press ready for a job the web pressman sets cylinders, rollers, knives, slitters, fountains, guides, stops, points, angle bars, etc. He measures packing and packs the cylinders. He pulls proof for an underlay, if an underlay is needed, and he marks out the sheet for it and underlays the plates. He registers the plates as to color and margin. If using a half-tone he pulls the proof for an overlay, cuts and matches it and overlays the plates. He next pulls a proof for spot-up sheets, marks it out, and puts the spot-up sheets over the overlay. He then covers the cylinder. He mixes colored inks to match proofs sent from the art room and keeps the color and impressions even. He adjusts all working parts of the press and examines printed product for spoiled sheets. He is in charge of the men under him and is held responsible for the output of the press.

In addition to the knowledge required of the cylinder pressman, the web pressman should know how to figure the amount of packing that is required on the impression cylinder. To do this he multiplies the number of teeth on the impression cylinder gear wheel by the circular pitch of the teeth—the pitch being stamped on the gear. This multiplication gives the pitch circumference, or printing line. He then measures the bare cylinder with a steel tape to obtain its circumference. By dividing each of these circumferences by pi (3.1416) he obtains their diameters, and one-half the difference between these diameters gives the thickness of the packing necessary to bring the impression cylinder up to the pitch line, or even with the bearers. The pressman generally adds about 0.003 of an inch to this amount for impression.

The plates are next put on the web press, being held down snugly to the cylinder by means of clips. The secret of good printing and long runs on a web press is that the circumference of both the plate and the impression cylinders should be equal, that the cylinders should be parallel, and run in harmony with each other.

The plates used on book and magazine web rotary presses for long runs are generally electrotype plates. Such a plate is made from the flat type form that has been set up in the composing room, by taking an impression of the form in wax under pressure. This wax impression is given a coating of graphite and also a coating of iron filings and sulphate of copper and is then put into the electrolytic bath, where a film of copper is deposited upon it. This sheet of copper is backed up with a composition consisting of tin, lead and antimony. When thus strengthened it is put through a curving machine, which bends it into semi-circular form to fit the plate cylinder.

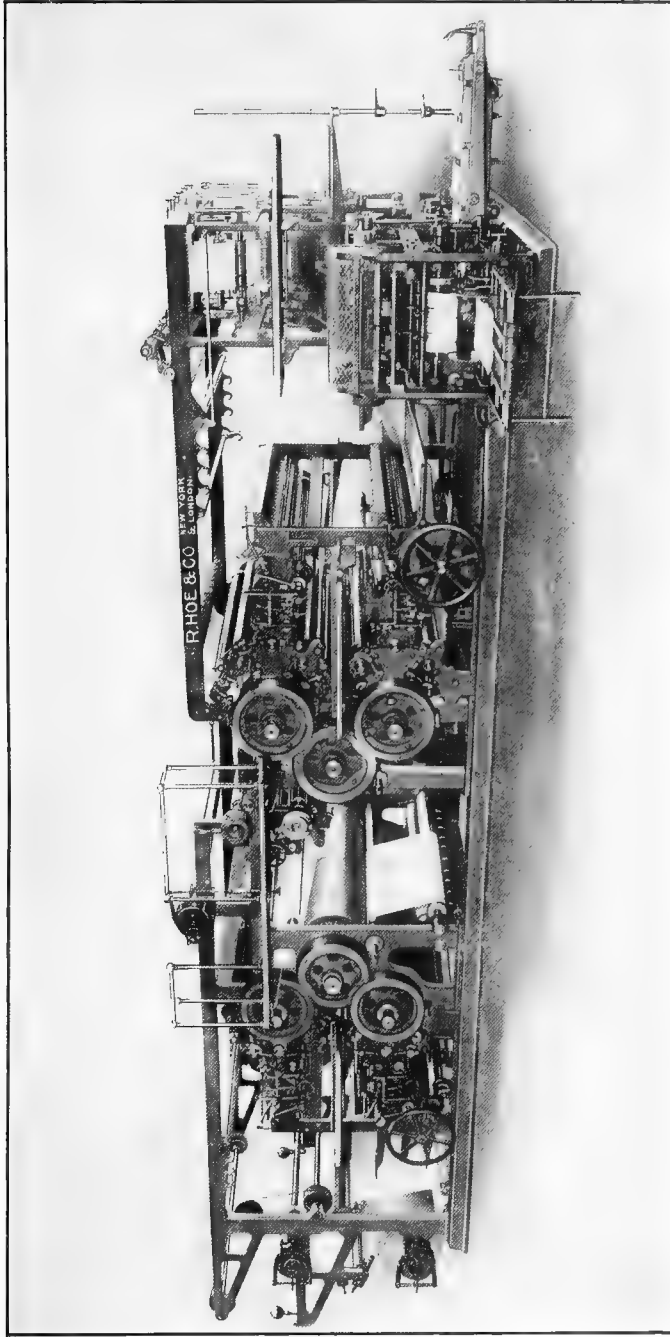
Certain colored inks set up a chemical action when in contact with copper faced electrotype plates, which on long runs destroy the face. A pressman should study these inks and know when to tell the electrotyper to steel face the plates.

The pressman next sets the rollers, which are adjusted by screws and should be set to get about one-eighth of an inch flat on them. If not set even the rollers soon give out, on account of too much friction. In the case of form rollers, each must be set with the same pressure against the distributing cylinders and the plate cylinders, as both of these surfaces are timed so as to run together. If the roller is set harder against one of these than the other there will be a drag on one of the surfaces, resulting in friction, which in turn generates heat. This soon causes a loss of the roller as well as a poorly inked plate.

The web pressman sets his trolleys, which help to propel the sheet along so as to have an even pull. In setting a slitter the flat edge should be set snugly to the side of the groove, causing the slitter and roller to cut the sheet similar to the cut given by a pair of scissors. If not set this way the slitter tears the sheet in a ragged edge.

The angle bars must be set at a 45° angle, thus insuring an equal pull, unattainable at any other angle. The nipping rollers are set to help the sheet along, and to insure an even fold. Folding blades should be set so as to tuck the sheet between the folding rollers, which must be set to crease the sheet into an even fold.

Gripper points must be timed to take the sheet and release it at the proper moment, otherwise the sheet will be torn. These must be set even and not too far out. The fly pans must be set to send the papers out on the strap in an even row.



BOOK AND MAGAZINE WEB PRESS

If the packing was perfect and the plates perfect, the pressman could now go ahead and print, but this ideal condition is never present; therefore, what is known as the make ready has to supply deficiencies in the plates and packing. On web presses very little underlaying is done. If the press calls for a plate 0.250* points thick, the foreman generally has them cut down to 0.247 points and adds a 0.003 point sheet under them, so that if the plates are high in any one spot he can cut out from under the plate, or, if on the run the high lights are beginning to fill up, he takes this sheet from under the plate.

A web pressman needs to know rather more about mechanics than the cylinder pressman, particularly as regard the calculations and action of gears.

SIGNIFICANCE OF THE OCCUPATION

There are about 400 magazine and book web pressmen in New York City; of this number about 300 are in the pressmen's union. The number of positions in this line is growing in importance, due to the increase in the volume of work done upon these presses. A man competent to fill this position should be a first class mechanic. Practical knowledge is generally gained in the shop. The technical knowledge needed for full comprehension of the work must be gained through some outside agency.

ASSISTANT ON MAGAZINE OR BOOK WEB PRESS

The web press assistant puts the rollers into the press and removes them. He takes a roll of paper ready for the press, puts it on the spindle and locks it into place so that it will not come loose when the press is running. When a roll of paper is exhausted he removes the paper core from the spindle. He cleans and oils the rollers and press, keeps the fountains filled with ink, leads the paper through the press, patches up, helps make register as to color and margins, and assists the pressman in underlaying and overlaying the plates. The feeder runs the brake and tensions and helps the pressman in a general way.

The feeder has charge of the rollers on the web press, and as these rollers are of different diameters and lengths he must know where each roller goes. He should know the names of the different parts of the press. He should understand imposition, how to adjust the spring rollers to the size of the paper rolls and

* Points here refer to 0.001 of an inch.

how to run the brake and regulate the tensions to keep the waste at a minimum.

The assistant in book or magazine web press, although not in direct line of promotion to pressman, occupies a position of some responsibility, and in order to do his work effectively needs to possess a large part of the knowledge required by the pressman.

SIGNIFICANCE OF THE OCCUPATION

There are about 700 assistants on the web presses in New York City and of this number about 500 of them are in the Assistant's Union. The chance of promotion is very slight, but the wages paid are high enough to attract men to the position who are willing to stay in it. The number of positions are increasing because of the increase in the number of web presses. Practical knowledge can be gained in the shop, but the technical knowledge necessary for full mastery of this job must be gained outside of the shop.

ROTOGRAVURE PRESSMAN

The rotogravure pressman puts the etched cylinder into the press, sets cylinders, doctor blades, compensating rollers, guides, stops, grippers, etc. He registers cylinders for margin, adjusts the impression cylinder for impression and sharpens and regulates the amount of pressure on the doctor blade. He keeps the ink at a certain constant density and adjusts all the working parts of the press. He examines the printed product for spoiled sheets and is responsible for output of the press.

In putting the cylinder into the press, the pressman sets the impression cylinder down and tests for the proper position by means of paper between the cylinders. If the cylinder is deeply etched he adds more impression. The impression cylinder is driven by friction, and the size is not built up to the same circumference as on other presses. The pressman should know how to sharpen and set the doctor blade. This blade presses on the surface of the etched copper cylinder, scraping all of the ink from unetched portions which represents the blank parts of the printed sheet. The pressure of the blade on the surface of the plate is adjusted by weights, and great care must be used in setting the doctor blades so as to not have it wear too quickly. The more often a blade is changed the quicker the plate wears.

The pressman should know how to tell the proper density of the ink, as this must be kept constant. The ink is thinned by a very volatile substance which evaporates quickly. When the ink becomes too thick the pressman adds xylol to thin it. The pressman should know what a well printed sheet is and how to detect and remedy trouble. The mechanism of a rotogravure press is about the same as a web press, and what applies to the mechanical requirements of a web pressman also applies to a rotogravure pressman.

SIGNIFICANCE OF THE OCCUPATION

There are about 100 rotogravure pressmen in New York City. Of this number about 75 are in the Pressmen's Union. The line of promotion is to foreman. This position has only been created within the last few years and is bound to increase in numbers due to the high class of work done by these presses and also on account of their increased speed, as in other cases, practical knowledge can be gained in the shop, but the technical knowledge must be gained outside.

ASSISTANT ROTOGRAVURE PRESSMAN

The assistant helps to put the cylinders into the press, gets the rollers ready for the press, keeps the press supplied with paper and removes the empty paper cores. He cleans and oils the pipe rollers and press, fills the ink, fountains, leads the sheet through the press and runs the brake and tension. He helps pressmen in a general way.

He needs the same equipment as the assistant on the magazine and web press.

OFFSET PRESSMAN

The offset pressman sets cylinders, distributing and form rollers; water and ink fountains, guides, stops and automatic feeders. He puts plates on the plate cylinder and packing on the packing cylinder. He washes off the prepared plate and pulls proof for register, registers plate, color and margins and, if necessary, etches blank part of plate, and gives the design a coating of asphaltum. He keeps the rubber blankets clean, sees that the color and impression are even, mixes inks to match proofs sent from art room and adjusts all working parts of the press,

including automatic feeders. Finally, he examines all printed copies for spoiled sheets and is responsible for the output of the press.

The offset pressman should possess the requirements for a cylinder or web pressman. He should also know how to regulate the water fountain and run the press with a minimum amount of water, in order that the design will print best. He should know how to register for colors and margins by shifting his plate, paper file or cylinder. He must keep the ink from scumming up the plate, which will happen if the ink is too greasy. The pressman should know how, by the aid of an acid solution in the water fountain to keep the blank parts of the plate clean. If the design becomes weak he should know how to apply a coating of asphaltum to strengthen it. He should know how to add acid resist to the design and re-etch the blank parts of the plate.

The offset pressman, furthermore, should understand the composition of the blankets in order to renew their vitality. He should know how to mix colors so as to match a given proof, and how to regulate color. He should have a knowledge of the properties of the zinc and aluminum printing plates. He should know the names of all the parts of the press and have a knowledge of its mechanism that he may make necessary adjustments, including those on automatic feeders. Finally, he should know what a well printed sheet is and how to detect and remedy trouble. He is responsible for the output of the press.

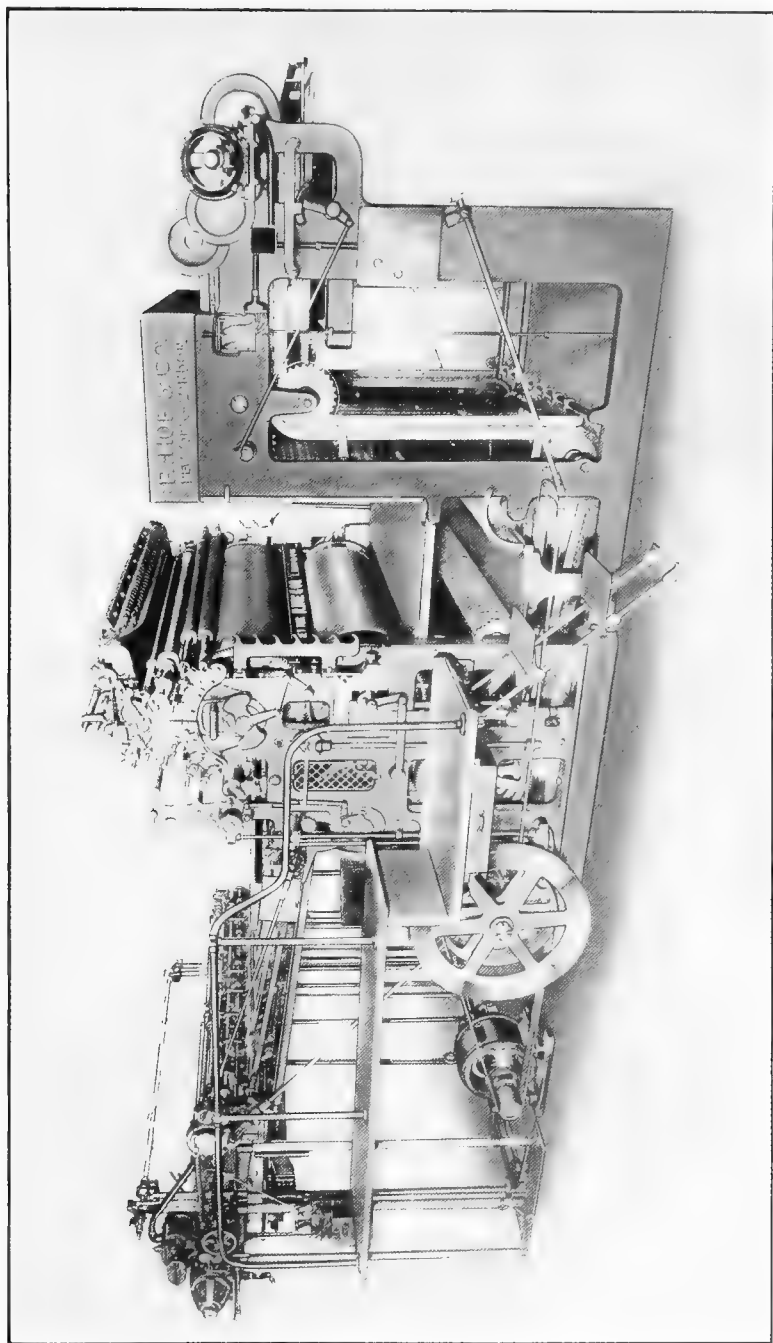
Besides the knowledge of fractions and mechanics required by the cylinder pressman, he should be familiar with the apothecary system of weights and measures in order to mix etching solutions and should understand the chemical action that takes place when acid solutions and metal interact.

SIGNIFICANCE OF THE OCCUPATION

The number of positions of this kind is increasing on account of the substitution of presses using zinc and aluminum plates instead of the stone process. The technical knowledge necessary for this position is greater than for an ordinary cylinder pressman. The practical knowledge can be learned in the shop, but much of the technical knowledge must be gained on the outside.

ASSISTANT OFFSET PRESSMAN

The assistant offset pressman puts the rollers into the press



OFFSET PRESS—AUTOMATIC FEED-PILE DELIVERY

and takes them out. He oils and cleans rollers and press and assists pressman in cleaning blankets and gumming up plates. He helps pressman put blankets on cylinders and helps make register as to margins and color. He piles paper into the feed board and feeds it down to the guide. He attends to the automatic feeders and assists the pressman in a general way.

The assistant offset pressman should know the names of all the different parts of the press, and should know how to put the different rollers into their respective places. He should understand the composition of the rollers used so as to be able to clean them without destroying them. If nap form rollers are scraped the wrong way the nap is injured, thereby destroying the roller. He should know how to clean the blankets and gum up a plate. In oiling it must be remembered that a new press needs oiling more often than an old one. Important bearings should be watched closely to prevent their becoming too warm. He should know how to feed sheets down to the guides properly. He should know how to operate the automatic feeder.

The knowledge required for his regular duties is indicated above. To prepare for advancement the assistant must equip himself to meet the requirements of the pressman.

SIGNIFICANCE OF THE OCCUPATION

There are about 100 men engaged in this work in New York City, about one-half of whom are members of the union. What has been said about the assistant on a magazine and book web press applies here.

JOB PRESSMAN

A job pressman is called upon nowadays to operate small sized cylinder and rotary presses as well as platen presses. He sets either platens, cylinders on bearers or cylinders, according to the type of press operated. He sets rollers, grippers, guides, stops and automatic feeders. He locks form or plate to the bed of the press or plate cylinder, pulls a proof for an underlay, underlays plate or form, if underlay is needed. He next makes register for margins and color. If working on half tones, he pulls a proof for an underlay, cuts and matches overlays and overlays form or plate. He pulls a proof for a spot-up sheet, marks out a sheet for a spot-up sheet and puts it on the cylinder.

He covers up the platens, or cylinder, keeps color and impression even, mixes colored inks to match a given proof, examines the printed sheet and adjusts all working parts of the press.

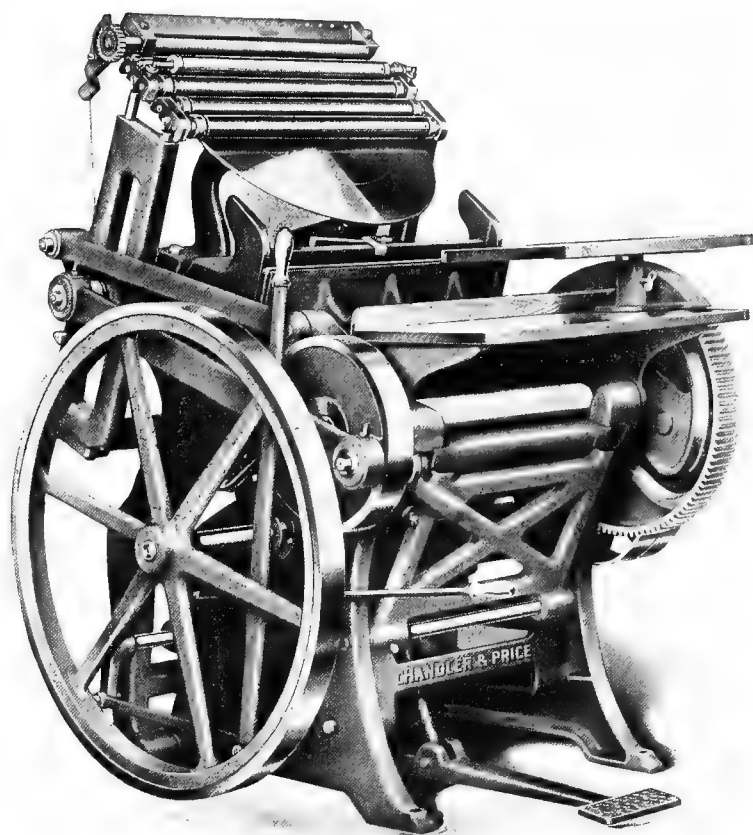
If the pressman is operating a platen press, he should know how to set the plates so as to obtain an even impression over the whole surface of the form. This is done by putting the proper packing on the platen and adjusting the top screws. The bottom screws are very seldom touched, as the impression at this point is regulated by the amount of packing. In putting the form on the press, the pressman sees that the clamps are tight. The duties of a job pressman from this point on, are about the same as those of the cylinder or rotary pressman, except that his machine is a very small one. For knowledge required, see "cylinder pressman."

SIGNIFICANCE OF THE OCCUPATION

There are about 1,000 job pressmen in New York City. Of this number 327 are members of Printing Pressmen's Union No. 51. On account of the introduction of automatic feed job presses the demand for job pressmen is not increasing. Some of the automatic job presses do the work of two or more hand fed presses. The chances for advancement for a job pressman are slight, as a very small number become cylinder pressmen. The wages paid, however, are high enough to attract many workers to this branch of the work.

JOB PRESS FEEDER

The job press feeder puts rollers into the press and removes them. He inks, oils and cleans rollers and press. In inking with a brayer, or knife, no impression of the form should be made until the ink is sufficiently distributed so as not show any streaks on the paper. He helps register forms; patches up sheets marked out by the pressman. He feeds paper into the press with his right hand, first putting the sheet to the bottom guides and then gently sliding it along to the side guides while the press is open. After this sheet is printed he removes it with his left hand, as the press is opening, and starts again with another sheet. When he misses a sheet he trips the press. In a few shops he operates automatic feeders. He examines the printed product, calls the pressman's attention to anything he thinks wrong, and assists the pressman in a general way.



A STANDARD TYPE JOB PRESS

The job press feeder should know how to patch up sheets neatly and quickly, using a minimum amount of paste. He should know how to move the guides to obtain good register. He should also know what a well printed sheet is. For a press with an automatic feeder the operator needs to know how to attend these feeders and make the necessary adjustments.

Quickness and accuracy of movement are necessary, both to feed paper into the press and remove it, since the average press operates at the rate of 1,500 sheets an hour. Skill is required to patch up sheets and to make delicate adjustments for the automatic feeders.

What has been said in regard to the cylinder press feeder applies to the job press feeder both in regard to knowledge required and preparation for advancement.

SIGNIFICANCE OF THE OCCUPATION

There are 500 job press feeders connected with the Job Press Feeders' Union No. 1 in New York City. Of this number, about fifteen are advanced each year to the position of job pressman and about thirty-five to that of cylinder press feeders. The position of job press feeder is most important in the small printing shops of the city. In these small establishments there are about 1,500 job press feeders who are not affiliated with the union. Most of these workers remain in this position, although a number become discouraged and enter other lines of employment. The introduction of automatic feeders is decreasing the number of men in this occupation, since one operator can tend three or four automatic presses. The job press feeder may secure in the shop the knowledge needed to do the work satisfactorily, but the knowledge need for promotion to something better, must be secured through some outside agency.

NEWSPAPER PRESSMAN IN CHARGE

In getting the press ready, the pressman sets cylinders, rollers, knives, slitters, fountains, guides, stops, points, angle bars, trolleys, compensating rollers, etc. He measures packing for the impression cylinders, registers the plates as to margins and regulates and keeps the color even. He adjusts the impression cylinder and keeps the cylinders parallel, and adjusts all work-

ing parts of the press. He examines the printed product for spoiled sheets. He directs the men under him and is responsible for the output of the press.

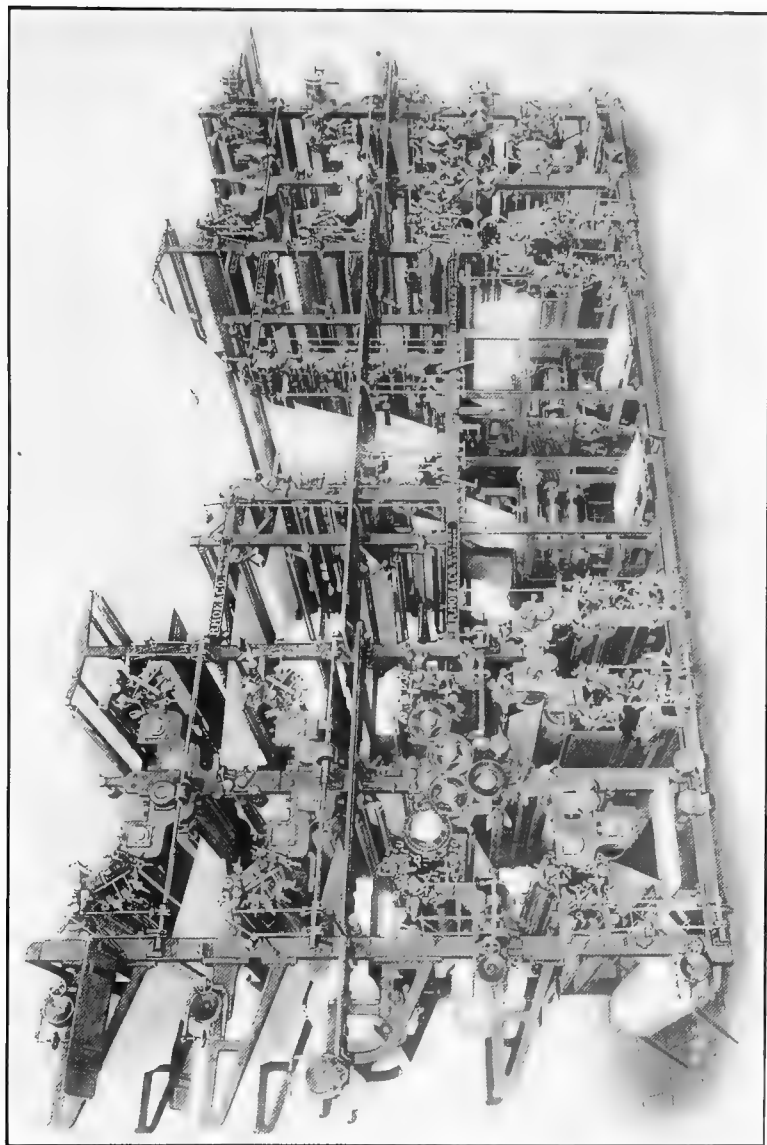
The plates used on a newspaper web press are stereotype plates. A matrix of paper is made, under pressure, from the type form, set up in the composing room. This matrix is bent into semi-cylindrical form and semi-cylindrical castings 7/16" thick composed of tin, lead and antimony are made in the matrix as a mold. The edges are then shaved, the dead metal routed out and the sides trimmed. The plate is then ready for the press.

There are autoplate machines on the market that can turn out three finished plates a minute. Twenty to fifty plates can be made from the same matrix.

The newspaper pressman in charge must set his cylinders parallel and the proper distance apart. Newspaper presses do not have any bearers and it is more difficult, therefore, to set the cylinders on such a type of press. In order to set the cylinders the pressman first multiplies the pitch of the gear on the impression or plate cylinder by the number of teeth to get the pitch circumference. He then measures the circumference of the bare plate and impression cylinders, and divides each of these by pi to obtain their diameters. One-half of the difference of the diameters of the plate cylinder and the gear gives the thickness of plate to be carried; and one-half of the difference of the diameter of the bare blanket cylinder and the gear gives the amount of packing to be carried. To the amount of packing calculated the pressman, due to the soft packing used, adds 0.020 points. This total amount allows for impression and is the amount of packing used. He uses a gauge to set his cylinders, putting it between the two cylinders and gradually letting them down by adjusting the impression screws until the cylinders are at the proper distance apart and parallel. He next measures his packing by the use of a micrometer and has the pressman dress the cylinders.

The directions given under "Magazine and Book Web Pressman" for the setting of rollers, fountain, trolleys, slit, angle bars, nipping rollers, folding blades, gripper points and fly pans apply equally in the case of the newspaper pressman.

The knowledge required is also very similar. The position of newspaper pressman in charge, however, is one of greater responsibility and he should possess executive ability sufficient to effectively direct the men under him.



DOUBLE OCTUPLE NEWSPAPER PRESS

SIGNIFICANCE OF THE OCCUPATION

There are about 200 pressmen in charge in New York City and they are all in the Newspaper Pressmen's Union. These positions are practically constant on account of the increased output of the new types of presses. Quick thinking is very essential for the newspaper pressman, as indicated by the rule "do not stop the press unless absolutely necessary." A man in this position may become a foreman. Practical knowledge can be gained in the shop, but the technical knowledge needed must be gained from some outside agency.

PRESSMAN ON NEWSPAPER PRESS

The pressman puts rollers into the press and removes them; puts blankets and muslins on the impression cylinders or covers impression cylinder with pressboards, hangers and top sheets and puts plates on the plate cylinders. He underlays plates. He gets rolls of paper ready for the press, keeps press supplied with paper and removes empty paper cores. He cleans and oils rollers and press, fills fountains, leads sheets through the press, patches and keeps fold of the sheet even. He runs the brake and tensions.

He should know the names of the different parts of the press. The rollers are of different sizes and he should know how to put them in their respective places. He should know how to dress cylinders and how to keep them smooth and even. He should know the imposition of the plates so as to get them on in their right places, and in putting plates on cylinder he should be careful not to spring them. He should know how to underlay plates and to patch up sheets marked out by the pressman in charge, and how to lock rolls of paper on the spindles, so they will not work loose when the press is running. He should know the leads of the different sheets through the press, for if the "lead-up" is wrong the sheets will be out of register, and consequently be spoiled.

He oils the press and what has been said about oiling for a cylinder feeder applies here. He should have a knowledge of the folder, as he has to keep the fold of the sheets straight and even. He should know how to carry an even tension, as the register and folds of the sheets, as well as a clean cut, depends upon this adjustment. The tension is adjusted by means of blocks and a screw covering the spindle head, and more tension is applied

by turning the screw which tightens the block. He must adjust the spring rollers, when a change is made from a full to a $\frac{3}{4}$ or $\frac{1}{2}$ roll. To do this properly some knowledge of the composition of forces is desirable. He should understand the operation of the rheostat controlling the motor for starting and stopping the press.

He should possess in general the knowledge noted in the case of the assistant on book and magazine web press and the cylinder feeder.

SIGNIFICANCE OF THE OCCUPATION

There are about 800 of these men in New York City and all are members of the Newspaper Pressmen's Union. The number of these positions is practically constant, as noted under newspaper pressman in charge. The chances of promotion to pressman in charge is in the ratio of 1 to 5. The practical knowledge can be gained in the shop, but the technical knowledge required must be gained from some outside agency.

FLYBOY ON NEWSPAPER PRESS

The flyboy carries plates to and from the press, leads the sheets down the former and through the folding cylinder and watches folder and former to prevent paper choking up press. He piles papers on tables and carries them to mail or delivery room. He cleans former and folder and compensating and pipe rollers. He fills and adjusts paste fountains and helps the pressman in miscellaneous ways.

He should know the names of the different parts of the press, the leads of the sheets through folder and should know how to adjust paste fountain. He should know the imposition of the plates, so that he can place the plates alongside of the press in position convenient for the pressmen.

SIGNIFICANCE OF THE OCCUPATION

There are about 450 in this occupation in New York City and all are connected with the Newspaper Pressmen's Union. Promotion is not rapid. At the end of about eight years, however, flyboys become pressmen. This is dependent upon the condition

of the business. These boys must be physically strong. The knowledge needed on the job can be learned in the pressroom, but the knowledge needed for advancement must be gained elsewhere.

SUMMARY OF THE TRADE STUDY

The foregoing findings concerning the composing and press rooms of the printing trade of New York City indicates a very large centralized industry that is steadily increasing in numbers and output and constantly making use of new and progressive methods of production. They show an industry in which industrial peace has been the rule for many years, and where trade agreements between employers and employees have been successfully maintained, and trade disputes adjusted through a system of arbitration. They also indicate a situation representing good wages and steady employment and where success and advancement are largely dependent on alertness of mind and a store of both general and specific information. The findings also represent, at least in the composing room, an organized system of apprenticeship, receiving boys at 16 years of age with a regular scheme of advancement. In the composing room this apprenticeship system very largely, supplies the ranks of the adult workers.

On the other hand, the findings indicate that this apprenticeship system is not sufficient to furnish the related technical knowledge demanded for full mastery of the trade with its constantly advancing standards. They also indicate that only in a small range of establishments is it possible for the apprentice to secure the broad, practical experience necessary for the all round skilled worker.

Such a situation seems to indicate that instruction in the nature of pre-employment courses for boys before the age of 16 years would fulfill a helpful function, at least in preparing for entrance to the composing room. The findings also indicate very clearly that instruction arranged for workers already employed and adapted to the needs of the various special departments and various degrees of advancement, would serve a valuable purpose both to the individual trade worker and to the interests of the trade in general.

OUTSIDE AGENCIES FOR THE TRAINING OF PRINTERS

In New York City there are at least eleven different agencies offering courses of instruction to men and boys who are either already at work in the printing trade or who desire to enter it. The duplication and overlapping of courses for beginners, as well as the lack of courses for men who desire advanced work, are clearly shown in a study of these different schools.

Of the fifteen hundred persons taking these courses, over 90 per cent. are men and boys who are already at work in the trade and less than 10 per cent. are boys preparing to enter it.

SCHOOLS ESTABLISHED BY THE BOARD OF EDUCATION

The Board of Education of the City of New York has established trade preparatory courses in printing in the three vocational day schools, and trade extension courses in printing in five evening schools. The organization and methods of these schools are described at some length in Part V of this report. Below is a brief description of the work of each school as it relates to the printing trade. The day courses are open to any boy 14 years of age who either is a graduate of the elementary schools or who can show that he is prepared to take the work by successfully passing an examination given by the principal of the school. These courses are two years in length. The courses in the evening schools are open to those working at the printing trade.

DAY TRADE PREPARATORY COURSES IN PRINTING

DAY VOCATIONAL SCHOOL FOR BOYS

The printing department in this school was organized in 1909 and is the oldest trade preparatory course in printing in the city. The original equipment has been added to until the print shops are the best equipped (school print shops) in the city. There are three shops devoted exclusively to printing, i. e., the hand com-



PRESSROOM—VOCATIONAL SCHOOL FOR BOYS

posing room, the pressroom and the linotype and monotype room. The hand composing room is furnished with a poor equipment accommodating twenty boys; the pressroom has five job presses, one modern cylinder press, one stop cylinder press and a paper cutter; in the machine composing room are five linotypes, one monotype, with extra keyboards for the linotype and standard typewriter keyboards for the monotype.

At the time of the survey fifty-two boys were enrolled in this department. The boys spend five periods each day in the shop, and three periods in related work. The shop instruction is individual in character and during the second year boys are allowed to specialize on the linotype, monotype, pressroom work or in hand composition. The course is two years in length, but the diploma of the school is withheld until the boy has worked at the trade six months and his work has been approved by his employer.

There was little attempt made at the time of the survey to teach typographical design, cost estimating or to organize special courses in English for the pupils in printing. The numbers enrolled in this department were so small that it was impracticable to provide teachers with special training to teach related subjects. The limited numbers also made it impracticable to grade the boys according to their previous education or ability in shop work. The students in this department were required, however, to take a course in lettering with the instructor in sign painting.

Six teachers of shopwork are employed in this school; two teachers of hand composition, one of whom acts as head of the department; a teacher of press work, a teacher of bookbinding and one each for the linotype and monotype machines respectively. The cost for salaries for the six shop teachers who give all of their time to the boys registered in printing is \$8,000. This department has had since last July an average enrollment of 53 boys.

The work of this department is devoted largely to the printing of records, cards and circulars for the Board of Education. The value of the product of this department amounts to about \$1,000 a month.

MURRAY HILL VOCATIONAL SCHOOL

The printing department in this school was organized February 2, 1914. The department is located in a basement room and

is poorly lighted and ventilated. The equipment consists of the usual small shop hand typesetting equipment, two small job presses, one automatic job press, a paper cutter and stitcher. The course of study includes hand typesetting, straight display and tabular, the imposition of small forms for job work, the care and use of job presses and the operation and care of the automatic job press. The boys spend three periods a day in the shop and four periods a day in book work. At the time of the survey forty boys were enrolled in this department. One instructor of printing is employed who teaches both the composing and press work. The number of boys enrolled in this department is so small that it is impracticable to provide instructors with special training to teach the related subjects, such as typographical design, cost estimating and applied design. The small numbers made it necessary to combine the boys from two trade groups for the work in drawing, English, mathematics and science, and as a result these courses were general in character.

BROOKLYN VOCATIONAL SCHOOL

The printing department in this school was organized in June, 1915. The equipment and course of study are practically the same as at the Murray Hill School, with the exception of the automatic press. Forty-six boys were enrolled in this department at the date of the survey. One teacher of printing is employed who teaches both the composing and presswork.

The conditions in this school in regard to the numbers enrolled, the character of instruction are practically the same as those described in the Murray Hill School.

PUBLIC EVENING SCHOOL COURSES IN PRINTING

HARLEM EVENING TRADE SCHOOL

The Harlem Evening Trade School, which is maintained in the same building as the Vocational School for Boys, has the advantage of the superior equipment of this school and as a result the number of printers enrolled in this school is larger than in any other public school. Courses are given in hand composition and press work, in the care and operation of linotypes and in the care and operation of monotypes. There were 152 students enrolled in the night printing classes. They were employed in the following occupations:



CLASS IN LINOTYPE OPERATING—HARLEM EVENING TRADE SCHOOL

PRESSWORK (2 classes)		MONOTYPE WORK (2 classes)	
Apprentices	14	Journeymen	17
Feeders	11	Two-thirders	3
Helpers	3	Monotype Caster and Operator....	3
Pressmen	2		
Asst. Pressmen	2		23
Compositors	2	LINOTYPE WORK (2 classes)	
Washer-up	1	Journeymen	20
Bookbinder	1	Apprentices	12
Brakeman on Press.....	1	Two-thirders	6
Shipping Clerk	1	Linotype Operator	1
		Machinist	1
	38	Grocery Clerk	1
			41
HAND COMPOSITION (2 classes)			
Apprentices	24		
Helpers	7		
Feeders	7		
Compositors	6		
Machine Hands	2		
Proof Boy	1		
Order Clerk (Printing).....	1		
Clerk	1		
Unclassified	1		
	50		

MURRAY HILL EVENING TRADE SCHOOL

There were four courses offered for compositors and pressmen at this school at the time of the survey. Two courses were offered in composing room work and job press work, and two courses in the care and operation of the Kelly Press. The courses in composing room work and job press work were sixty nights in length and the courses in Kelly Press work were twenty-four night courses. Each of the two sections of the course in Kelly Press operation was limited to sixteen pupils. Sixty-two students in the four courses filled out questionnaires giving their occupations as follows:

COMPOSING AND PRESS WORK		KELLY PRESS WORK	
Apprentices	11	Pressmen	22
Pressworkers	8	Feeders	6
Errand Boys	4	Pressmen's Apprentices	3
Helpers	4		
Proofreaders	2		31
Compositor	1		
Shipping Clerk	1		
	31		

STUYVESANT EVENING TRADE SCHOOL

There are two courses in proofreading offered in this school. Each course consists of sixty two-hour lessons. At the time of the survey sixty students had enrolled for this course. Forty-six were in attendance and filled out questionnaires, giving their occupations as follows:

PROOFREADING

(2 classes)

Journeyman	18
Apprentices	8
Proofreaders	5
Copyholders	4
Editorial Work	2
Stenographers	2
Foreman	1
Salesman	1
Bookbinder	1
Reporter	1
Decorator	1
Writer	1
Secretary	1
46	

BROOKLYN EVENING TRADE SCHOOL

There are five courses offered for printers in the Brooklyn Evening Trade School; two courses in composition and press-work; two courses in the care and operation of the linotype and one course in proofreading. At the time of the survey 95 men were enrolled in these classes. Their occupations follow:

COMPOSITION AND PRESS WORK

(2 classes)

Apprentices	20
Helpers	5
Feeders	4
Pressmen	3
Clerks	3
Journeyman	2
Two-thirders	2
Copyholders	2
Linotype Operator	1
Machine Hand	1
Errand Boy	1
Stock Clerk (Printing)	1
45	

LINOTYPE WORK

(2 classes)

Compositors	16
Apprentices	10
Two-thirders	4
Linotype Operators	3
Proofreaders	2
Helpers	2
37	

PROOFREADING

(1 class)

Copyholders	4
Journeyman	2
Two-thirders	2
Apprentices	2
Printing Salesman	1
Clerical Work	1
Cutting Machine Worker	1
13	

ELEMENTARY EVENING SCHOOL No. 95, MANHATTAN

There is one class in printing at this school. The twelve pupils in attendance gave their occupations as follows:

Apprentices	7
Errand Boys	3
Barbers	2
	12

The numbers enrolled in each of the evening trade extension classes in printing were so small that it was economically impossible to obtain an organization of classes based on the previous trade experience of the applicants. No one class in printing in the evening schools was made up entirely of apprentices, two-thirders, feeders, pressmen or journeymen compositors. In only two classes was an attempt made to plan the course of study to meet the needs of special groups of workers.

The equipment provided in most cases was so limited that the work was necessarily very elementary in character. No courses were maintained for printers in English, cost estimating, mechanics, typographical design, color work, chemistry or the theory of magazine and book web presswork.

Little evidence was found that the employers' associations or unions were co-operating with the school authorities in developing practical or related courses.

SCHOOLS MAINTAINED UNDER PRIVATE AUSPICES

SCHOOL FOR PRINTERS' APPRENTICES

The School for Printers' Apprentices of New York was organized as a co-operative school January 1, 1913. It is managed and financed jointly by Typographical Union No. 6, the Employing Printers' Section, New York Branch of the American Newspapers Publishers' Association and the Hudson Guild, a social settlement at 436 West 27th Street. The Union contributes \$2,000, the Employers a like sum and the Guild \$1,000 and rent for the maintenance of the school each year. A Board of Directors, consisting of four members from each of these bodies, determines the policy of the school.

Registered apprentices who have had at least one year's previous experience in printing offices are eligible for admission.

The object of the school is to instruct only those who have shown a determination to make printing their vocation. Both day and night classes are conducted at the school. Over 100 employers in the city permit their apprentices to attend two hours of one afternoon each week, on the employer's time, with the proviso that the apprentice will attend one night each week on his own time. There are at present 346 pupils enrolled in the school. All branches connected with the composing room are taught in the school except machine composition. English composition, spelling, grammar and punctuation are also taught as supplemental to the apprentices' needs.

A new equipment costing \$6,000 was recently contributed to the school by men interested in printing. This equipment is not excelled in point of efficiency by that of any plant in the city.

NEWSPAPER PRESSMEN'S SCHOOL

Realizing the need for technical courses for their members, the officials of Newspaper Printing Pressmen's Union No. 25 established a school at the union headquarters in the fall of 1916. This school was open from September until March. Two hundred members of the union availed themselves of the opportunity to secure technical instruction relating to their daily work. The course of study included lectures on types of presses, methods of printing, chemistry of inks, rollers and paper, mathematics through mensuration and the simple mechanics of cams, levers, screws and gears.

The courses were offered four afternoons a week for the night workers and an equal number of evenings a week for the day workers. On account of the limitations of room and the number demanding instruction, it was found necessary to limit the attendance of each class to one afternoon or one evening a week.

EMPLOYING PRINTERS' SCHOOL IN ESTIMATING AND COST FINDING

A course in estimating and cost finding is maintained by the Association of Employing Printers. This course was started several years ago by the Typothetæ of the City of New York and was taken over by the Association of Employing Printers when the Association was organized. There are 67 men enrolled in this class, which is made up of employers' salesmen, office men,

foremen, journeymen and apprentices. The course consists of fifteen lessons of three hours each. The classes meet twice a month from 6:30 to 9:30 o'clock. Home work is required of each pupil. On account of the limited facilities at the Association Headquarters it has been found necessary to refuse a large number of applicants. A fee of \$15 is charged for this course.

THE WEST SIDE Y. M. C. A. SCHOOL OF PRINTING

The circular issued by the Y. M. C. A. gives the following information concerning this school:

"The Y. M. C. A. School of Printing is maintained to assist ambitious boys and to provide competent workmen for the printing industry of New York City. It is closely connected with the printing trade through an Advisory Committee composed of ten employing printers well known in the city.

"Enrollment in the school is open to shop apprentices only, whether employed in composing or press rooms, or whether employed in closed or open shops, and irrespective of religious affiliations.

"Each apprentice is expected to spend either one morning (of four hours) per week of his employer's time at the school, this to be devoted to actual work of composition or press work. In addition, he is expected to spend two evening sessions (of two hours each) per week on his own time, this to be devoted to academic study along lines applying particularly to his work.

"The enrollment in the school is made through the boy's employer, sometimes by part payment by the boy, and sometimes entirely by the boy's parents."

The tuition fee is \$50 per annum.

At the time of the survey twelve boys were enrolled in this school.

PRESSMEN'S CORRESPONDENCE COURSES

The International Printing Pressmen's and Assistants' Union has developed correspondence courses for its members. This course was established in 1911 and is given by the school maintained by the Union in Tennessee.

Courses are offered in platen press work, cylinder press work, rotary press work and planographic press work. These courses include the study of the various types of presses, mechanical adjustments, methods of make-ready, underlaying, overlaying, study of inks, rollers, papers and blankets.

These courses are considered by many printing authorities as being the best courses offered in presswork and have been a great help to the pressmen who have taken them.

The price of each course is \$5 and the deficit incurred is paid by the union.

There are 88 pressmen in New York City taking these courses. Thirty-five pressmen have graduated from these courses.

INTERNATIONAL TYPOGRAPHICAL UNION CORRESPONDENCE COURSE

The I. T. U. course in printing was developed and perfected in response to a demand voiced at the annual meeting of the Union in 1907. A commission was appointed to develop the course of study, and after careful consideration of the problem decided that a course should be given by correspondence. The course of instruction was developed by the Inland Printer Technical School in Chicago. Local secretaries have been appointed to assist in developing the courses.

There are two courses offered, one in hand lettering and principles of typography and the other on capitalization, punctuation and other elementary typographical principles. The first course consists of thirty-seven lessons on lettering, design, color harmony, composition, hand lettered advertisements, layouts of booklets and books, paper making, plate making and imposition. The second course consists of nine lessons on punctuation, use of capital letters, proofreaders' marks and their meanings and type faces and their uses. The course in lettering, design and principle of typography costs \$25 and the course in capitalization, punctuation and elementary typographical principles costs \$10. The International Typographical Union gives a prize of \$5 in the form of a rebate to each student who finishes the full course, but not to those who take the short course only.

At the present time there are 234 students in New York City taking the above courses. Seventeen students in the city have graduated from the course.

THE BARON DE HIRSCH TRADE SCHOOL

The Baron de Hirsch Trade School conducts a day class in printing covering five and one-half months. The equipment consists of a composing room and five job presses. Instruction is given in composition, imposition, presswork and printing shop practice. The average number of graduates, each six months, since the course was instituted in June, 1913, has been eighteen.

THE NEW YORK TRADE SCHOOL

The New York Trade School conducts an evening class in job composition and presswork. The class meets three evenings a week for a period of six months. The course is arranged for young men of from 17 to 25 years of age, who are either engaged in the trade or are beginners. The tuition fee is \$14. The enrollment for the past year was twenty students.

OTHER SCHOOLS

In addition to the above mentioned agencies there are three private trade schools offering courses in linotype and monotype operating. Courses are also given in linotype and intertype operating at the New York factories of the companies which make these machines. The instruction is limited to representatives from plants in which these machines are used.

RESOLUTIONS ADOPTED BY CONFERENCE COMMITTEES

EMPLOYERS' COMMITTEES

When the findings of the survey were completed, they were submitted to the conference committees appointed by the Association of Employing Printers and Master Printers' Association and the following resolutions were adopted by the committees:

1. With the exception of a few minor points* the committee approves the facts as represented in this report.

2. This committee recommends that the Board of Education establish a Central School of Printing and consolidate in it all printing equipment now used in the three day vocational schools and the evening trade schools. With the limited facilities now provided in each of these schools, it is impossible to secure sufficiently large numbers of students to allow them to be grouped according to their previous training and experience. The Central School would give an organization large enough to enable the teachers to grade the pupils according to their rank in the grade. It would also give a large enough organization to provide for special teachers for special subjects. The committee heartily endorses the recommendation of the establishment of a Central School of Printing.

3. In order to make the school more effective, the committee recommends that a special advisory committee of nine members be appointed to assist the Board of Education in developing this school, and that such advisory committee be made up of four representatives from employers' associations, four from labor organizations and one other member; such committee to be

*These items were later modified in accordance with the view of the committee.

appointed by the Board of Education. This committee should be given liberal powers over the school, such as providing courses of study, checking up the work of teachers to see that the work meets the practical needs of the trade, to assist in selecting of equipment and in giving examinations from time to time to determine the fitness of the boys who enter the trade.

4. The City of New York now owns the old Wynkoop-Hallenbeck Building. This committee strongly recommends the setting aside of the four upper floors of this building for the Central School of Printing. This building is well lighted and was used by printers for a number of years. There are about 12,000 square feet of floor space on each floor. The committee recommends that the upper floors of this building be remodeled and put in first class shape for the School of Printing.

5. The committee recommends the continuing of a two-year day vocational school course, such course to be open to any boy 14 years of age who has completed the grammar school, or who is in the 7th or 8th grade, and recommends that preference to enter the printing classes be given to applicants who have completed the work of the elementary school.

6. This committee recommends that in selecting apprentices, the employing printers in New York City give preference to the graduates of the Central School. The committee feels the need for the day school training, not with the idea of turning out more apprentices, but with the idea of training boys so that they will make better apprentices.*

7. The committee recommends that the City equip this school with modern print shop equipment. The industry is changing so very rapidly that it is impossible to use equipment that was con-

* At the conference at which these recommendations were adopted, the committee assured the members of the survey staff present that every graduate of this school would be taken care of in the office of members of the association, and promised the hearty support of the Association of Employing Printers in placing the graduates of this school. They also stated that they would be very glad to give the boys who graduated from this school, who show unusual ability, a higher rate of compensation than is paid to the boy taken on from the regular grammar school or from the streets.

sidered up-to-date a few years ago. The only way to demonstrate to the printers in New York that the work of the day vocational school is worthy of consideration is by installing a modern equipment whereby the boys can learn the best practices that are in use in the modern composing and pressrooms.

8. This committee recommends that the Board of Education establish continuation classes for all boys who are apprentices in the printing trade. They strongly urge as a committee that the members of their association send their apprentices to this school for four hours per week with pay, with the understanding that the boy is to attend two nights a week on his own time. The committee believes that this course should be maintained for two years, that is, during the boy's first and second year apprenticeship. They recommend that courses be given in English, proofreading, display composition, drawing, arithmetic, theory of presswork, mathematics and mechanics and care and operation of presses.

9. This committee heartily recommends the establishment of evening classes in the Central School for the printers who are engaged during the day, and the establishment of afternoon classes for printers who work at night. The committee feels that this is the big problem in vocational training for the printers and recommends the following courses:

1. English.
2. Proofreading.
3. Lettering.
4. Color Harmony and Design.
5. Hand Composition.
6. Book Composition.
7. Linotype and Intertype Operating.
8. Monotype Operating.
9. Imposition.
10. Arithmetic for Compositors.
11. Estimating and Cost Finding.
12. Mathematics and Mechanics for Pressmen and Feeders.
13. Courses in the Chemistry of Inks, Rollers, Blankets, etc., for Pressmen.
14. Courses in Platen Presswork, including the Care and Operation of Automatic Feeders.
15. Courses in Theory and Practice of Cylinder Presswork.
16. Courses in Theory and Practice of Magazine and Book Web Presswork.
17. Courses in Theory and Practice of Offset Presswork.

18. Courses in Underlaying, Overlaying, etc.
19. Courses in Color Work for Pressmen, including the mixing of inks.
20. Courses in Electricity for Printers.

10. The committee also recommends that a registration fee of \$2 be required of all journeymen who desire to take extension courses. That such fee shall be returned upon the completion of 75 per cent. of the full attendance.

11. The committee recommends that an Exhibition Room be provided in this school; such room is to be used in exhibiting the best examples of printing produced in New York City and outside of the City. This could be used to good advantage in teaching the young men coming into the trade the possibilities of quality printing.

12. The committee also recommends that quarters for a reading room be provided for the men who wish to come to the evening school to attend classes. A large number of men in the printing trade work in New York and live in the suburbs and many of these men will undoubtedly make it a practice to stop off at the school for afternoon or evening classes. The committee urges that comfortable quarters be provided for these men, either in the form of a reading room or library.

13. The committee also recommends that in the matter of the examinations for the men who wish to teach in this school the advice of the advisory committee be sought. It is hardly necessary to state that this committee strongly urges the employing of men who have had exceptional training in the trade.

Finally, the committee feels that the printing industry in New York is so large that the problem can be handled more efficiently in a modern, well equipped Central School of Printing.

The committee heartily endorses all the recommendations made and promises the hearty support of their organization in carrying out the above suggestions.

UNION COMMITTEE

The findings were also considered by the conference committee appointed by the Allied Printing Trades Council and the resolutions below were adopted by the committee. These resolu-

tions were subsequently brought before the following organizations in business meetings and were approved and adopted by them: Typographical Union No. 6, New York Printing Pressmen's Union No. 51, New York Newspaper Web Printing Pressmen's Union No. 25, Franklin Union No. 23 and New York Job Press Feeders' Union No. 1.

WHEREAS, At the request of Organized Labor's Conference Committee on Industrial Education the Board of Estimate and Apportionment of the City of New York appointed a committee to conduct an industrial education survey to determine the need of vocational training in the City of New York;

WHEREAS, The report of the committee shows that there is a need for vocational courses in printing in the City of New York, this Union recommends:

1. That the Board of Education establish a Central School of Printing and consolidate in it all the printing equipment now used in the three day vocational schools and in the evening trade schools.

2. That the Board of Education secure the four upper floors in the old Wynkoop-Hallenbeck building for the School of Printing. This building is located at the New York end of the Brooklyn Bridge and is an ideal location for the proposed school. The old Wynkoop-Hallenbeck building now owned by the City was formerly occupied by printers and is well adapted to the needs of the School of Printing.

3. That the Board of Education continue the two year day vocational course in printing; that such course be open to any boy 14 years of age who has completed grammar school or who is in the 7th or 8th grade. This committee also recommends that the attendance at the day school be limited to 300 boys. (As the trade normally absorbs about 400 boys a year the limit of the day vocational school to 300 boys will safeguard the trade inasmuch as the graduating class of any one year will never exceed 100 or 150 boys).

4. That the Board of Education establish part-time industrial classes for all first and second year apprentices in the printing trade. This committee also recommends that the employers send their apprentices to this school for four hours per week with pay with the understanding that the boy is to attend two nights a week on his own time during the 3rd, 4th, and 5th years of his apprenticeship training. That courses be given in English, proofreading, display composition, drawing, arithmetic, hygiene and civics for the composing room apprentices and theory of presswork, mathematics, mechanics, hygiene, civics and the care and operation of presses for the press room apprentice.

5. This committee heartily recommends the establishment of day and evening classes in the Central School of Printing for men and women engaged in

the printing trade. The committee recommends the establishment of the following courses:

1. English.
2. Proofreading.
3. Lettering.
4. Color harmony and design.
5. Hand composition.
6. Book composition.
7. Linotype and Intertype operation.
8. Monotype operating.
9. Imposition.
10. Arithmetic for compositors.
11. Estimating and cost finding.
12. Mathematics and mechanics for pressmen and feeders.
13. Courses in the chemistry of inks, rollers, blankets, etc., for pressmen.
14. Courses in platen press work, including the care and operation of automatic feeders.
15. Courses in theory and practice of cylinder press work.
16. Courses in theory and practice of magazine and book web press work.
17. Courses in theory and practice of offset press work.
18. Courses in underlaying, overlaying, etc.
19. Courses in color work for pressmen, including the mixing of inks.
20. Courses in electricity for printers.

6. That the Board of Education require a registration fee of \$2.00 of all men and women in the trade who desire to take extension courses in the afternoon or evening classes; that such fee shall be returned upon the completion of 75 per cent of the course.

7. That the Board of Education appoint a special advisory committee of nine members to assist in developing the School of Printing, such advisory committee to be made up of four members representing employers' associations, four representing labor unions, and one other member. That the Board of Education consider the recommendations of this committee on the following points:

1. Courses of study.
2. Training and experience of teachers.
3. Character of equipment.
4. Examination of pupils from time to time to determine their fitness to enter the trade or continue at the trade.

8. That the Board of Education provide an exhibit room in the Central School of Printing, such room to be used for exhibiting the best samples of printing produced in New York City and elsewhere.

9. That the Board of Education provide a modern up-to-date library and reading room for the men who attend the School of Printing.

ENDORSEMENT OF INTERNATIONAL PRESIDENT

A copy of the Printing Report was submitted to Mr. George L. Berry, President of the International Printing Pressmen and Assistants' Union of North America. Mr. Berry's comment upon the report is below :

INTERNATIONAL PRINTING PRESSMEN AND
ASSISTANTS' UNION OF NORTH AMERICA
OFFICE OF THE PRESIDENT

Pressmen's Home, Tenn.
June 1, 1917.

Mr. Lewis A. Wilson, Director,
Industrial Education Survey,
49 Lafayette St., New York, N. Y.

My Dear Mr. Wilson :

Your Committee in charge of the Printing Survey made in New York City has been kind enough to submit to me a general outline of the work accomplished, and to this work I have given careful consideration.

In the first instance the principle underlying the program of research in Graphic Arts was correct and exemplified the new thought that is gaining ground throughout the world, wherein trade education is recognized as being important to the welfare of employer, employee and to society as a whole.

As a printer I can best pass upon the value of that part of the report dealing with the pressrooms of the newspaper and commercial offices, and to this part of the report I have given especial attention. It is a splendid accomplishment; it embodies the assembling of facts that can be grasped quickly. It will do much in the promotion of a better understanding of the trade, and it moreover will do much in bringing the interest of the trade into a more harmonious relationship.

The International Printing Pressmen and Assistants' Union maintains its Trade School; it believes in improved craftsmanship. It aspires to the highest conception of printing. It therefore is in full accord with the splendid recommendations growing out of the review and survey that has been made by the Committee in charge of this work in behalf of New York City. Our endorsement, therefore, is unqualified, and we are in hopes that the successes so far attained will meet a happy reception from the Board of Estimate of New York City to the end that the permanency of the recommendations may be assured.

Very respectfully yours,

GEORGE L. BERRY,
President.

**ENDORSEMENT OF OFFICER OF THE NEWSPAPER
PUBLISHERS' ASSOCIATION**

**Mr. Lewis Wilson, Director,
Industrial Education Survey,
49 Lafayette St., New York.**

Dear Mr. Wilson:

I have read with interest the report on the printing trade, and heartily endorse the recommendations made by the committee appointed by the Association of Employing Printers, and the resolution adopted by the Printing Unions.

The development of a central school of printing will give New York City an institution that will adequately meet the needs of the printing trade in this city. The advantages of such a school are very clearly outlined in the report.

Very truly,

DON. C. SEITZ,
Chairman, Conference Committee
Newspaper Publishers' Association

REPORT OF ADVISORY COMMITTEE

The special advisory committee upon educational provisions for the printing trade, after giving a large amount of time to the consideration of the findings, submitted a report emphatically recommending the establishment of a Central School for the printing trade.

Among other arguments the committee present the following: "At present no school is large enough or important enough to organize its courses of instruction so as to comprehensively meet the demands of the trade. Such courses could be provided in a Central School of Printing. The need for such a school is urgent. Its advantages over the present scattered courses of instruction are numerous and unquestionable. Some of the more important of these are as follows:

"In the first place, a central school of printing permits certain economies in administration not possible in schools of other types.

"The success of a vocational school depends to a large degree upon the co-operation of the three parties vitally concerned in the problem, i. e., the employers, the employees and the school authorities. The employing printers' associations and unions have recommended the establishment of a central school of printing. It is evident that both employers and employees will show great interest in such a central school, and will co-operate with it in many useful and important ways. They will look upon it in a sense as *their* school, and it will mean much more to them than if a number of courses in printing were given in departments of several schools.

"A central school of printing, with its extensive and complete equipment, would attract and hold the interest of men in the trade who under present conditions do not care to attend the schools in which the equipment is scanty and of poor quality.

"A central school would permit a considerable variety of courses; unit courses, graded courses, advanced and specialized courses in trade subjects, etc., such as cannot be given in the present schools. The printing industry in New York City has enough workers easily to provide a sufficient number of students for such a central school.

"A central school of printing could not only organize courses in different subjects, but it could organize separate courses for persons of different ages or ability; courses for apprentices, for the two-thirders, for the journeymen and for the foremen. The separation of trade pupils into such natural groups would add greatly to the efficiency of the instruction. A sufficient number of students of the various grades would be available in a central school to permit such separation. This is impossible in the present schools because of lack of numbers.

A central school of printing, because of the variety of its equipment and the specialized skill and ability of its various teachers, could more readily and effectively adapt its courses to the changing needs of workers than is possible in the departmental type of school. The active co-operation of an advisory committee of the kind that a central school could readily secure would serve to keep the instruction in close accord with the technical requirements of the workers.

"With its staff of expert teachers, each a specialist in his line, a central school should do much to maintain high standards of printing in New York City. With such a staff the school might effectively serve both the city and the industry as an experimental trade laboratory."

In regard to the relation existing between a central school and day vocational courses the committee makes the following statements:

"The vocational training of young persons who desire to enter the printing trade will represent a relatively small part of the total work of a central school of printing; but such a central school could contribute decidedly to the efficiency of such vocational work. The advantages of a central school in this connection may be summarized as follows:

"The facilities provided in a central school will be large enough to give boys a thorough training in the fundamental principles of the trade in modern, well equipped shops. The equipment now provided for the print shops in the vocational schools is inadequate for this purpose. The committee appointed by the employers' association emphasized the need of a modern, up-to-date equipment so as to give the pupils enrolled in the pre-employment classes an appreciation of a well equipped shop.

"The number of pupils enrolled in a central school of printing would be large enough to permit grading them according to their previous school training.

"This large number will make it possible to provide an organization with special teachers for at least the following departments:

- (1) Department of Typography.
- (2) Department of Presswork.
- (3) Department of Applied Art.
- (4) Department of Related Studies.

"It is not economically practicable to secure such a differentiation in the printing departments of the vocational schools as at present organized. The organization in such schools, as a rule, is not large enough to differentiate even between the presswork and the composing room work. In the Murray Hill and Brooklyn Vocational Schools the instructors of printing teach both pressroom and composing room work. It is still more difficult to develop special courses in design and other important allied subjects in printing departments where the total numbers enrolled are small."

In dealing with the need for additional trade extension courses the committee makes the following points concerning the value of a central school for such work:

"The committee appointed by the employers' associations and unions heartily recommend the establishment of evening trade extension classes for printers who are engaged during the day and afternoon trade extension classes for workers who are employed at night. This Committee believes that such classes present the largest opportunities for vocational education in the printing trade. There are 27,000 trade workers engaged in the composing and pressrooms in New York City. The printing trade is becoming more and more specialized, and as a result the trade is not self-instructing. An important part of the training of the workers must come through outside agencies. The advantages of a central school for this type of training may be summarized as follows:

"1. An equipment large enough to offer both elementary and advanced shop courses.

"2. Trade workers would attend who do not care to attend a school in which the equipment is not comparable in quality to that of the commercial shop.

"3. A student body large enough to be graded according to previous trade experience.

"4. Numbers which would make it possible to offer many courses not practicable at the present time.

"5. The equipment and teaching staff could be used for both afternoon and evening trade extension courses. This arrangement would demand a staff of expert trade teachers who would give full time for certain periods to teaching.

"6. The men in the trade would have a personal interest in the central school of printing and the efficiency of the school would be increased by the exchange of ideas and social intercourse of a large group of trade workers.

"7. The higher possibilities of the trade could be emphasized in such a school by lectures on trade processes, new machinery and allied subjects, and by exhibits of various types of printing showing the possibilities of quality printing.

"8. Both employers and employees recommended the establishment of part time classes for the first and second year apprentices in the trade. This situation can be met adequately by a central school of printing.

"9. Eighty-seven per cent. of the 27,000 composing and press-room employees work in the Borough of Manhattan. Most of these work in offices located below 44th Street. A central school of printing located at the lower end of Manhattan would be conveniently located for these men and courses could be offered at hours to meet their needs."

In summing up the situation the Committee quotes an employing printer as follows:

"The quality and effectiveness of printing depends to a large degree upon the ability of the workers. If New York City is to retain its leadership in the printing world steps must be taken to provide training for the workers in the trade. The comparatively small investment required to give New York a thoroughly effective school of printing will bring substantial and constant benefits to the city."

In the report of the advisory committee on day vocational schools the following paragraph concerning a central school for printing appears:

"In regard to the school organization best fitted for such training (pre-employment training) they (the committee) believe that in the case of printing the instruction should be given in a central school, for the reasons that more complete equipment and a more comprehensive teaching organization can be so secured, greater co-operation with the industry is possible and better control could be had over the numbers entering training in relation to the needs of the trade."

PART II

INSIDE ELECTRICAL WORK

BRIEF HISTORY OF THE ELECTRICAL INDUSTRIES

The application of electricity to practical use is a development of less than four decades. Before that time its use was limited to telegraphy, electric bells, electric gas lighting, electro-plating and medical batteries. Telegraphy had been widely introduced, but the other uses enumerated were of restricted application. Soon after the Centennial in 1876 the telephone began its commercial career. Within the next decade the dynamo was developed and successfully applied to electric lighting. Later the electric motor was greatly improved and applied to power transmission and other uses. Coincident with the solution of the lighting and transportation problems was the development of electrical power upon a large scale. The use of electricity in the chemical industries upon a commercial scale began during the nineties. The development of wireless telegraphy and telephony is a matter of recent date.

In this short period of less than forty years one of the greatest of industries has been evolved and has attained an importance little short of marvelous. Not the least striking feature of this extraordinary development is the multitude of highly efficient workers that has arisen to deal with the new and intricate problems involved.

The various branches of the industry have become highly specialized and each has developed a group of workers skilled to meet particular requirements. An example is afforded by the branch of the industry to which this survey is devoted, viz., that of inside wiring.

OUTLINE OF THE DEVELOPMENT OF WIRING

In the beginning electrical appliances and methods of wiring were necessarily crude, for example, the first incandescent light plant to be operated by private individuals (that of the Steamship Columbia), was wired with No. 11 for the "lamp loops;" the wire being double cotton covered magnet wire "paraffined and painted over all." Sockets, cut-outs, rosettes, cleats, switches, bases and the like were at this time composed of

wood. Wires were supported on knobs and cleats of wood but many circuits were laid in plaster. Later, glass was utilized in the construction of some of these devices and was followed by porcelain, the material now generally employed for exposed work.

The natural solution of the problem of safe installation was found in the employment of protecting conduits. The first form of conduit evolved was hard rubber composition tubing, then papier maché in rigid lengths which were coupled by means of squeeze connections, which in turn was followed by papier maché with brass covering, known as "brass armored tubing."

The present form of installation is found in rigid steel, galvanized or enameled iron conduit which is used on practically all important concealed work in fireproof buildings and for considerable exposed work. This type of conduit, with some improvements, is considered the most approved system of electrical installation. Only a few years ago circular loom tubing and attex wire came into use for concealed electrical installation in private houses, taking the place of knob and cleat work. This gave place to flexible conduit, which is now generally succeeded by the so-called "B X" system.

This system, which consists of a conductor covered with rubber, braids and steel flexible armor, came into use on account of the facility with which it can be installed, but nothing has been brought into the market to take the place of the iron conduit as a mechanical standard for important buildings. On exposed work wood molding was employed until metal and wire molding came into the field. Today the standard methods of wiring are installation in rigid enamel iron conduit, or in metal and wire molding or the employment of steel armored conductors (B X).

DEFINITION OF INSIDE ELECTRIC WIRING

This survey is limited to a study of inside electrical work, as defined in the following paragraph:

Inside electrical wiring, in contradistinction to outside wiring, is that branch of the subject that has to do with the installation of conductors, from the exterior point to which the central station furnishes its mains. In other words, the term "inside wiring" generally refers to those conductors which carry the electric current from the service mains to the various points of the building. The term has grown, however, to include accompanying devices, such as panel boards and switches, elevator

control apparatus, fans, motors, etc., connected to these conduits. In some instances, though the appliances are outside the building, they are included under the term "inside wiring," as illuminated signs, standards, etc. In general, the term "inside wiring" includes all of the installation beyond that furnished and installed by the central station.

The kinds of installation that are permissible under different conditions, the materials that may be employed, the manner of performing the work, are determined by the National Board of Fire Underwriters and the Department of Water Supply, Gas and Electricity of New York City. Before an installation may be put into service it must be inspected and passed by these authorities.

IMPORTANCE OF THE TRADE

The era of modern electrical development came with the introduction of the incandescent lamp. In the early days of electrical illumination only special buildings were wired for electricity, as it was considered a luxury, and illuminating gas continued to hold popular preference.

There were very few electricians in the earlier stages of the trade. The records of the labor unions, for example, show that in 1890 approximately 100 men were organized, while today the several unions of electrical workers have a membership of 4,885; a growth of 27 years. By way of further explanation, it may be noted that in 1916 there were admitted into the electrical union of New York an approximate total of 375 new men and 40 apprentices, all raised to the status of helper.

The importance of the trade of electric wiring in New York City may be gauged by the fact that during the year 1916, buildings were equipped with inside wiring to supply electricity for 1,492,146 incandescent lights, 634 arc lamps, 98,513 horse power in electric motors and to convey 7,039 K. W. from dynamos installed in isolated plants.

The money value of the electrical contracts during the same year amounted to over \$6,000,000. The electrical contractors who installed this work employed 6,815 electrical workers, 3,180 of whom were journeymen, 2,940 helpers and 695 apprentices. The inspection department of the City received in the year 1916 a total of 90,451 applications for the approval of electric light and power equipments, representing an increase of 17,092 over the number of applications received during the preceding year.

NATIONALITY OF WORKERS

The only available data bearing upon the nationality of the workers in the electrical trades are the figures published in the U. S. Census Report for 1910, which groups, under the general heading "Electricians and Electric Engineers," the 15,512 workers employed in this field in the City of New York. This figure includes, indiscriminately, all kinds of workers connected with the electrical industry from designing and supervising engineers on the one hand, to laborers on the other. Of this number about a third were of native parentage, somewhat less than a third were foreign born, and about six thousand were of foreign or mixed parentage.

TYPES OF ELECTRICAL CONTRACTING ESTABLISHMENTS

There are more than 1,600 electrical contractors and jobbers in Greater New York, ranging from the "one man shop" to the contractor with modern offices and shops employing from 5 to 350 men. They may be divided into the following classes:

(1) The jobber and bell hanger doing locksmithing, bell hanging and unimportant installations and repairs.

(2) The small electrical contractor who installs wiring in stores, lofts and offices, does light and bell wiring in flat and loft buildings, and repair work.

(3) The large contractor, who installs complete electric wiring and electrical equipments, and repairs and maintains installations in new and old buildings of all types and sizes from the one-family house to the 57-story building. He also sets up complete power plant installations.

There are between 600 and 800 of the so-called "one-man shops" in the Greater City in which locksmithing is combined with bell hanging, repairing sewing machines, etc. In these shops the proprietor does the work and only hires helpers when there is a rush of work on hand.

Of the small contractors there are between 500 and 600 who work on small contracts for wiring for light and bell systems in stores, lofts and offices, as well as wiring flat and apartment houses.

There are 405 of the larger electrical contractors. These contractors install complete electrical equipments in government and

public buildings, theatres, factories, hotels, private dwellings, apartment houses, ships, subways and bridges, and wire electric signs, amusement parks and other decorative and spectacular lighting.

SPECIALIZATION

There are many contractors, who, because of lack of capital, or experience, or because their knowledge of the trade is limited, cannot secure a license, and therefore devote their time to some one special branch of the trade. These men specialize in bell wiring and do small repair jobs. Another class of contractors specialize in the wiring of new flat and apartment houses, as well as moving picture theatres, and take some of the larger repair jobs. There are contractors who take all kinds of wiring work, handling the small as well as the large contracts, and there are contractors who specialize entirely in large contracts. On the side of the workers there is the same tendency to specialization but this is counteracted to a large extent by the need of proficiency in a number of branches of the trade in order to secure continuous employment.

Workers applying for admission to the union as journeymen are required to take an examination covering all the divisions of the trade.

HOW INSIDE ELECTRICAL WORKERS ARE TRAINED

In New York City nearly all of the large contractors have trade agreements with the union, providing for the length of apprenticeship, the number of apprentices that may be employed in each shop, the wages to be paid, and other details. The apprentice serves two years, followed by four years as a helper, before qualifying for a journeyman's status.

A boy enters the shop of a union contractor through personal application or by the contractor applying to the union for an apprentice. When an apprentice, not registered with the union, is taken on, the contractor gives the boy a letter to the union for the purpose of having him registered. In this letter he is required to state the number of men he has in his employ. Then if the contractor has not his full quota of apprentices, as allowed by agreement, the union registers the boy and issues a card to him. Under the union agreement one apprentice is permitted to each contractor and one additional for every 10 union men he employs.

The apprentice, after serving two years at the trade, may apply to the union to become a helper. To accomplish this he must take an examination given by the board of examiners of the union who pass upon his qualifications for advancement to helper. The examination covers the practical information the helper should possess, and the average boy after two years' experience at the trade usually passes it.

No systematic training is provided in this trade and that which the apprentice receives is indefinite, depending largely upon the size of the establishment in which he is employed and the nature of the work done by it. In many of the large establishments apprentices are called upon frequently to work with the men in the capacity of helpers. When so employed they do any work in the electrical line while assisting a journeyman, with the exception of connecting switches, panels and switch board fixtures.

The advancement an apprentice makes is dependent upon his aptitude and quickness of perception. While running errands and in the tool room, he learns the names of tools, materials, fittings and their uses. When working in the capacity of a helper, he cuts threads and couples conduits, helps to lay conduits in place, and sets, fastens and connects outlet boxes of the different types. He also bores beams and floors, runs, sets, fastens conduit and assists in "fishing" runs in conduits and the pulling in of wire. A bright, alert boy will pick up information from the men, and when ambitious he will take advantage of evening trade school classes. Many of the apprentices are attending evening schools.

A real opportunity for training occurs after the apprentice has served his two years, and passes to the status of helper. He is then allowed to work at any and all branches of the trade. By shifting from one contractor to another, each doing different classes of work, he may acquire a general knowledge of the trade.

After the boy has served four years as a helper, he may take the journeyman's examination and, if successful, he receives a journeyman's card and the union scale of wages.

A study of the records of the union in Greater New York shows that there are employed by electrical contractors, and registered in the Electrical Workers' Union, 400 apprentices. These boys are working for electrical contractors employing 4,885 men, of whom 2,730 are foremen and journeymen, and

1,775 helpers, all registered in the union. This data shows that there is approximately one apprentice employed to every twelve men.

There are very few apprentices, known as such, in the non-union shops. The boys employed in these shops are usually called "shop boys," and there are no rules governing the number employed, the length of training or the character of the work.

SCALE OF WAGES

The table below gives the union scale of daily wages for electrical workers:

Journeyman	\$5.20
Helpers	2.50
Apprentices	1.00

Eight hours constitute a day's work and four hours on Saturday. The union scale provides for double pay for overtime and also for work on Saturday afternoons, Sundays and holidays.

Below are shown the daily wages usually paid in union shops:

Superintendents	\$6.00 to \$10.00
Foremen	5.50 to 9.00
Assistant Foremen	5.20 to 7.00
Journeyman	5.20 to 5.50
Helper	2.50 to 3.00
Apprentice	1.00 to 2.00

Wages paid to foremen and assistant foremen vary according to their ability and the size of the work they are handling. Some foremen are paid on a basis of a yearly salary.

The non-union rate of wages is generally lower than the union rate.

REGULARITY OF EMPLOYMENT

Steadiness of employment in this industry, as in other building trades, is governed by the weather conditions, the amount of material available, prices of materials, and, at present, the European War.

In 1915 and 1916 the electrical industry entered on boom

times. The European war created the necessity for munition plants and factory buildings in which to make war materials. It created also an urgent demand for ships. In this work large numbers of electrical workers were employed and practically all union workers, and a very large proportion of non-union men, found employment because of the war conditions.

During normal times the electrical industry employs quite steadily practically all of the union workers available and about three-fourths of the non-union men. The employment of union men in such large numbers is explained in part by the fact that the large contractors deal only with union labor.

According to the union's agreement with contractors union men on a job are notified before its completion whether the contractor has other work on which to send them. If not, the men apply at once to other contractors and in this way they lose little time between jobs.

LICENSES FOR CONTRACTORS AND ELECTRICIANS

The Department of Water Supply, Gas and Electricity, of the City of New York, has a special board to determine the fitness of applicants for licenses to install electrical equipment in new and old buildings and to engage in alteration and repair work. This board consists of an officer of the department, a master electrician, a journeyman electrician, a member of the inspection department of the New York Board of Fire Underwriters, an electrician in the employ of a public service corporation of the city, an architect, or builder, of at least five years' practical experience, and a real estate owner.

Three kinds of licenses are granted upon the fulfillment of the necessary requirements:

License No. 1 is an authorization to engage generally in the business of installing, altering or repairing electric work. It is intended for electrical contractors and is issued to them yearly. The fee required in taking out this license is \$10 for the first year and \$5 for renewals.

License No. 2 is an authorization to install, alter or repair electric work in any specified building, such as department stores, office buildings, factories, hotels, etc. This license is intended for a house electrician and the fee is \$1 for the first year and \$1 for renewals.

License No. 3 is a special permit and is an authorization to

install, alter or repair electric work constituting a single job. The fee for each special permit is \$1.

The installation of electrical equipment must be inspected and passed before it can be put into service. To secure such authorization the work must be done in accordance with the requirements of the Department of Water Supply, Gas and Electricity, and in accordance with the requirements of the New York Board of Fire Underwriters.

TRADE ORGANIZATIONS

Employers' Associations.—In Greater New York there are six associations representing the electrical contracting interests:

1. Electrical Contractors' Association of New York.
2. Independent Elec. Contractors' Association of New York.
3. Associated Electrical Contractors of New York.
4. Electrical Contractors' Association of Long Island.
5. Metropolitan Electrical Trade Association.
6. Lighting Fixture Contractors' Association of New York.

On August 23rd, 1916, the first five of the above mentioned associations combined to form a central body known as the Advisory Board of the Electrical Contractors of New York. The sixth association is an independent organization of contractors, who specialize in assembling and installing fixtures.

In addition to the members of these regularly organized associations there are many contractors and jobbers not affiliated with any organization. The majority of these represent concerns which take the smaller contracts and repair work.

The Electrical Contractors' Association, organized in 1892, is composed of the more important contractors and has a membership of 45. A majority of its members are recognized as among the largest electrical contractors in the United States. They have an agreement with the local organization of workers by which they bind themselves to employ members of this local organization.

The Independent Contractors' Association of New York was organized in 1903 and today has a membership of 52, consisting of contractors who do less important work. A majority of the members of this body has a similar agreement with the local organization of workers.

The Electrical Contractors' Association of Long Island is

another organization formed by the contractors of Long Island, principally in Brooklyn, and has a membership of 79 electrical contractors and jobbers.

The Metropolitan Electrical Trade Association has a membership of 11, composed of electrical contractors making a specialty of repair work, armature winding and motor installation.

The Lighting Fixture Contractors' Association of New York has a membership of 7. It was organized by fixture installing contractors and assemblers as an independent association.

Employees' Associations.—The electrical workers in Greater New York were not organized until the year 1888, when organizations were started by three groups of workers, each unaware of the others' existence. The House Wiremen's Union had 12 members, the Knights of Labor Assembly No. 5468, had 14 members, and the American Federation of Labor had a membership of 50. The existence of these three unions became known to each other in 1890 and they had joint conference committee meetings until 1891, when an amalgamation of the three unions was accomplished, adopting the name of Local 5468, American Federation of Labor of New York and Vicinity.

Shortly afterward this union affiliated with the National Brotherhood of Electrical Workers of America and was known as Local Union No. 3 of the N. B. E. W. with a membership of 350.

The first agreement entered into with the electrical contractors was on July 6, 1893. In this agreement the formation of an examining board was set forth. This board consisted of two members of the union, two members of the contractors' association, and a fifth member chosen by the four. This examining board was to pass upon the qualifications of all members who were in the union or who might come in after the date of the agreement.

In 1895, at the convention in Cleveland, Ohio, this Local withdrew from the National Brotherhood, which latter became the International Brotherhood, and affiliated with the Knights of Labor, becoming known as Electrical Workers' Union No. 3.

In 1901 the Local reaffiliated with the International Brotherhood of Electrical Workers, retaining the local designation of Electrical Workers' Union No. 3. It continued under this designation until 1907, when it became the Inside Electrical Workers of Greater New York.

Working agreements between the contractors and the union

have developed co-operation between both parties that have averted labor troubles and increased wages. The Inside Electrical Workers of Greater New York has been able to deal with all transactions between contractors and workers harmoniously, and today has a new trade agreement which is entirely satisfactory to both parties. The membership of this union is now, approximately, 4,100.

The scale of wages and hours of work showing the improvement in trade conditions from 1890 to 1917 follows:

					Saturday
1890-1891	\$3.00	per day—9 hours			8 hours
1891-1894	3.00	" " 9 "			8 "
1894-1895	3.50	" " 8 "			4 "
1895-1908	4.00	" " 8 "			4 "
1908-1914	4.50	" " 8 "			4 "
1914-Oct., 1916.....	4.80	" " 8 "			4 "
Oct., 1916-Apr. 1, 1917.....	5.00	" " 8 "			4 "
Apr. 1, 1917.....	5.20	" " 8 "			4 "

The Inside Electrical Workers of Greater New York are not, strictly speaking, a building trades organization as they do not depend entirely upon the electrical installation in new and old buildings. There are many changes in electrical installation in old buildings, where wiring passed years ago is being modernized. The members of the organization also do a large amount of work in navy yards, marine work in the harbor of New York, and work in new and old power plants.

TRAVELING CARDS

Traveling cards are issued by the unions to members desirous of leaving the city to work elsewhere.

A certain percentage of the "traveling card men" move about because they are attracted to other cities on account of higher wages, or by an increased demand for electrical workers, or by some large operation. Another class of men leave their home city on account of strikes, dissatisfaction, or other reasons, and take up the trade in another place.

A third class who take out traveling cards are men who are employed by large concerns taking contracts all over the country, and their men travel wherever their employers have contracts, returning to their homes and local unions on the completion of an out-of-town contract.

With the increasing demands by the trade for men of regular habits, the "traveling card man" seems to be passing. Each year the number grows less and it would seem to be but a matter of few years when the transient electrician will be unknown. It is difficult to determine what percentage of electricians coming to New York remain here, as some stay a few weeks, others leave after a few months, others stay permanently, while practically all of the New York men leaving on traveling cards to work throughout the country, return here on completion of the contract.

ANALYSIS OF THE TRADE

In the following pages an attempt has been made to describe what the worker does in the principal divisions of inside wiring, the knowledge necessary to do the routine work, and that required for the full comprehension, necessary for intelligent mastery of the trade, or for promotion.

STEEL ARMORED CONDUCTOR WORK

Flexible steel armored conductors are made in two varieties, known to the trade as "BX" and "BXL". The former consists of insulated conductors surrounded by an armor covering composed of galvanized steel strips that are concave on one side and convex on the other. These strips are wound spirally upon each other, thereby rendering the whole flexible. "BXL" has, in addition, a lead sheath surrounding the insulated conductors and under the steel armor.

The special field for the employment of "BX" is in the wiring of finished private houses and alterations, for which purpose it is especially adapted. Its use, however, is not confined to this class of work. It is employed extensively in the cheaper variety of apartment houses and stores and also other conditions where many of the runs are not easily accessible and must be "fished."

The chief advantage of "BX" lies in the ease with which it can be installed and the consequent saving in labor expense. Being small in diameter and flexible it can be conveniently "fished" in corners, behind walls, under floors, etc.

The journeyman receives a plan or sketch of the installation to be made together with instruction from the foreman, or the contractor, and from these lays out his work. The positions where the outlets are to be cut or the floor raised, are determined

by the location of the new and old outlets on the floor below. For this purpose the journeyman employs either of two methods: First, he may take measurements from the outside walls of the building, or, Second, by boring a one-eighth inch hole at the outlet on the lower floor through the ceiling to the floor above until the tip of the gimlet appears. The location having been fixed, he next finds the position on the upper floor corresponding to any partitions there may be on the lower floor by measuring from the gimlet hole a distance equal to that from the downstairs outlet to the partition.

He removes base boards, cuts openings in walls and partitions for switches, receptacles and side outlets to the sizes of the boxes to be installed. With a flat, thin wood chisel and steel scraper blade, he cuts the tongue and raises flooring from outlet to the point where runs are to be "fished" under the floor.

When parquet flooring is to be raised the process is the same, except that the floor is removed in squares and there is no tongue to be cut. This operation demands much skill.

He then bores the beams to admit runs of steel armored conductors and cuts openings for the ceiling boxes. At these openings he fastens a board between two beams and to this screws the ceiling box. Side boxes may be set, either with plaster, or screwed to boards fastened between the studding, in a manner similar to ceiling boxes.

Frequently it is found impossible to push the "BX" through the partitions in this way. In such cases the journeyman has to resort to "fishing" with a steel tape ("snake"), or cord and chain, known in trade parlance as a "mouse".

The process of "fishing" frequently requires a considerable amount of skill, and much ingenuity is displayed in devising expedients to overcome obstacles. These present themselves, most frequently, in the form of obstructions due to bridging, nails and plaster between the studding. A cord with a short piece of sash chain attached is often used to find apertures. A mirror, held at an angle within a pocket, or opening, is sometimes used to light the space behind partitions.

In addition to ceiling, side, floor and receptacle boxes, the journeyman runs his conductors to panel boards, meter outlets and points of service boxes and connects to these boxes.

To complete the installation of the system, the journeyman grounds the steel armor to the water, or gas pipes on the street side of meters. After the work of wiring is finished, the jour-

neyman replaces the flooring, base boards, etc., and patches with cement or plaster the various openings around the boxes elsewhere. In addition, he is frequently called upon to replace the carpet, wall covering, and the like.

When installing "BX" in buildings in process of construction the necessity for repair and replacing floors, etc., is of course eliminated. In work in stores, the worker must also understand how to put up metal ceilings.

CONDUIT WORK

Rigid conduit represents the most advanced system of wiring. It is the most durable, as well as the safest from the point of view of fire hazard, and has the further advantage that the conductors can be changed after installation. If it should be found necessary at any time, larger wires can be substituted or additional conductors drawn into the conduit. In finishing a building where damage from carelessly driven nails is of more or less frequent occurrence, rigid conduit effectually protects the conductors. Again, the fact that the conduit is impervious to dampness and gases is a safeguard against corrosion. Rigid conduit lends itself particularly to the wiring of new buildings in the course of construction.

Wiring with rigid conduit comprises two distinct operations: First, the installation of the conduit itself, and, Second, the pulling in of the wires. The former only is discussed below. The subsequent drawing in of the conductors into the conduit is treated under "Circuit and Feeder Pulling."

The journeyman receives plans, or sketches, of the work which is assigned to him by the foreman or contractor, with whom he goes over the plans and layout. He prepares for the actual work of installing by marking out the positions of the various boxes. The journeyman then indicates to the helper, generally by marking, where the latter is to cut holes or chases for the introduction of the conduit.

He next lays out and measures the conduit to be cut and threaded by the helper, who sees that the burrs on the inside of the conduit, produced by cutting, are removed by a file or reamer, as otherwise the insulation of the conductors is liable to be scraped off by these sharp edges.

With a bending machine, or in the case of small sizes of conduit, with a "hickey," he elbows, bends, saddles and offsets the

conduit for the various runs. He has his helper couple the conduit, put on lock nuts, and return the conduits to the outlet locations.

Where concrete or tile flooring is used, he lays the conduit on top of the "I" beams, cinder filling or terra cotta brick. In vertical runs he hangs the conduit and temporarily fastens it in place for the bricklayers, or cement workers, to build into the wall. When the conduit is not built into the walls it is run in chases cut in the walls.

In wooden buildings he makes the horizontal runs on top of or beneath the beams. In making the vertical runs, the journeyman places the conduit in notches in the ceiling and floor plates and bridges, and fastens it in place.

The outlet boxes are made with circular spots in the metal shell upon which a blow with the hammer will produce a round "knockout" hole into which the conduit is connected. As many openings are made in each box as there are conduits to be connected. The conduits are made fast to the boxes by lock nuts and bushings. The boxes commonly used are panel, switch or receptacle, junction, pull, floor, ceiling, side telephone and watchman's clock. If the building wall is up before the conduits are installed the journeyman, or helper, drop cement into all outlet openings to close them and hold the boxes in place. If, however, the building wall is not up, he hangs the boxes and conduit from the ceiling beams with tie wire.

The journeyman "nipples out" and connects the conduits to boxes, plumbing and tying the latter in place for the bricklayer to build them into the walls or partitions.

While the greater part of the journeyman's work consists of "circuit" wiring, he also installs the larger feeder conduits between the panel, power or pull boxes from the basement to top floor of the building.

After finishing the installation of the conduit, the journeyman completes his work, as far as the conduit is concerned, by grounding the conduit system throughout the building at the different panel boxes and at the service box, by means of ground clamps and copper wire, making the final ground connections to the water or gas pipe line on the street side of the water or gas meters.

The knowledge the journeyman should possess to enable him to install rigid conduit is considerable as compared with some other classes of wiring. He should have a working knowledge of

the tools used in his work and the materials employed. In this connection he should know how to use threading machines, the different styles of stocks and dies and how to use the "hickey" and bending machines. He should be able to make the various kinds of supports properly, should understand the operations of setting and fastening panel and other boxes, and how to connect conduit to them. He should know how to brick, concrete, and terra cotta floors and walls and to drill these materials. He must understand how to mix plaster and cement for use in fastening boxes and hangers in place and for enclosing apertures.

For full understanding of his work the journeyman should, in addition to the preceding, know what size conductors will fit in the conduits. He should understand the reasons for the code rulings relating to conduit work. He should be familiar with two and three wire systems of wiring, the single pole, the double pole, triple pole, electrolier and three and four way switching systems. The scientific, mathematical and technical knowledge needed in common by all workers is summarized at the end of this section.

FLEXIBLE CONDUIT WORK

Unlike rigid conduit flexible conduit is not proof against water or other matter that can pass through the interstices between the convolutions of the spiral steel covering. Cement, often almost liquid, may seep through this conduit forming ridges and points which harden and scarify the insulation of the conductors when they are drawn in. If a sufficient quantity of cement works through the covering it may completely block the tube against the introduction of the wires.

The installation of flexible conduit differs from that of rigid conduit in two essential particulars: First, its flexibility permits of turning corners and fitting around angles without the necessity for elbows or bending, as in the case of rigid conduit. Second, the use of connectors for attaching one length of conduit to the next renders threading unnecessary.

With the flexible conduit the journeyman places the runs in the same way as with rigid conduit, i. e., horizontal runs upon beams and the vertical runs in chases between studding or built in walls.

The journeyman takes care to see that the bends are gradual and that in making bends he does not cause openings between

the convolutions of the spirals. He makes all runs tight, leaving no slack that may buckle when the wires are pulled in. He prepares boxes for connection with the conduit in the same way as with rigid conduit, and sets and fastens them in the same manner. He attaches the conduit to the boxes by means of a connector and lock-nut. In accordance with the Code he grounds the system to the water, or gas pipes, as with rigid conduit.

Flexible conduit installation requires practically the same knowledge as for rigid conduit work, except in regard to the bending, cutting and threading of pipes. The journeyman should understand those particular sections of the Code that apply to flexible conduit.

CIRCUIT AND FEEDER PULLING

CIRCUIT WIRES

The journeyman consults plans and specifications he receives from his foreman, or contractor, to obtain the sizes and kinds of conductors to be drawn in and the runs to be made. He then obtains the necessary coils, or reels, of wire and makes pay-out reels on which he places the coils. This arrangement permits him to pay out the conductors without twisting.

For pulling the wires into the conduits the journeyman employs a steep tape called a "snake."

Having succeeded in introducing the "snake," he attaches the ends of the wires to be drawn in. He then feeds the wires into the conduit, the helper assisting by pulling the "snake" at the other outlet. After the wires are pulled in, they are tested and tagged for identification.

FEED WIRE PULLING

The journeyman learns from instructions, plans, lists, sketches or wiring diagrams the class, size and amount of wire to be installed. He cuts coils, or reels, of these wires of proper lengths for the lines to be pulled. These he mounts on pay-out reels as described under "Circuit Wire Pulling," using two or three reels, according to the needs of the installation.

In drawing in feeder wires the workman introduces them into the conduit at the top of the building and draws them from outlets below. By this method he takes advantage of the weight of the feeder to assist him in drawing in. After the snake has been attached, he pulls in the feeders with the assistance of the helper.

When the ends of the feeders have reached the second outlet, the journeyman pushes the "snake" through the conduit to the third box and repeats the operation of drawing in the wires, at each floor. By pulling feeders through in short runs in this manner the labor of pulling is diminished and there is less strain on the conductors. When pulling in large size feeders, the journeyman first passes his steel tape through the conduit and with it draws in a steel cable, or rope, which in turn he uses to pull in the feeders.

Great care must be taken when pulling in large cables in long vertical runs as the weight of the wire tends to cause it to creep, or slide away, into the conduit. Should it drop into the conduit so rapidly as to get beyond control and fall, great damage to the cable and the building may result. To guard against this damage a break is arranged on the feeder and reels to control the speed with which it feeds into the conduit. In vertical runs of this description, the workman makes the cable fast at the upper end by hanging it from insulators on "I" beams, or form supports, and at pull boxes on the different floors it is further held by clamp supports.

The journeyman engaged in circuit and feeder pulling should be able to determine the sizes of wires by observation and by the use of the wire gauge and must be familiar with insulations and braids. He should know how to anneal and bend hooks in steel tapes and how to splice tapes and wires without the use of soldering. He should be able to tell when one tape comes in contact with another in a conduit and how to make them engage. He should know how to feed conductors into the conduit, and how to clean conduits of dirt or cement. He should be able to remove insulation from conductors without damaging the wire. He should know the sizes and numbers of wires that may be drawn into different sizes of conduits, and how long to leave the ends of the wires at various outlets, panels, switch boxes, etc.

For feeder pulling the journeyman should know, in addition, how to make horses for heavy reels; how to attach feeders to cable and rope and how to handle and manipulate heavy feeders and cables; and how to support and hang them in accordance with the requirements of the inspection departments. This last involves a knowledge of the proper installation and fastening of insulator, insulator hangers and supports.

In this work special skill is required to overcome obstructions in passing the "snake" through the conduit.

METAL MOLDING

When installing metal molding as an exposed work extension from a concealed conduit installation, the worker locates the electric light and switch outlets as desired, or follows plans and specifications. He provides the nearest conduit outlet with a split adapter plate, cuts the molding base to the length required with a lever hand shear or hacksaw, and punches a key hole slot at the end with a lever hand punch. In fireproof construction he locates the holes to be drilled in the concrete, brick or terra cotta ceilings or walls by setting the base temporarily in place and marking through the holes in the base with a pencil. He drills holes with star drills and plugs them with lead shields or inserts toggle bolts, after which he fastens the base with wood screws or toggle bolts. On metal or plastered ceilings and walls the worker uses toggle bolts and wood screws for supporting the base.

The journeyman uses base couplings to extend the moldings, which are supplied in $8\frac{1}{2}$ ft. lengths. He employs 45° and 90° flat elbow fittings and external and internal elbow fittings for breaking around obstructions. Cross and "tee" fittings are attached by him to enclosed double branches, or taps, in wiring. On the bond screw and slot principle he fastens to the molding attachment plugs, combination fixtures, drop cords, receptacles and rosettes.

The journeyman installs outlet boxes of various types, attaching them to the molding base with single and double clamp bushings. He encloses the wires in the base, at the same time clamping the capping in full lengths over the base containing the wires. As the work of installation progresses he connects the wires to the devices he is installing.

The journeyman should be familiar with the Electrical Code provisions governing the installation of metal moldings. He should know how to cut moldings and punch key hole slots in them; how to locate and set outlet fittings; drill holes in concrete, brick walls and ceilings; how to plug these with lead shields, and attach moldings and fittings with screws and toggle bolts. He should be able to skin the wire, without damage, connect to the devices being installed, enclose these and snap the capping over the base. He should be able to make, solder and tape joints.

OPEN WORK WIRING (KNOB AND CLEAT WORK)

Exposed knob and cleat work, while one of the simplest forms of electric light installation, is unsightly and unsuitable for use in any place where neat appearance is a consideration. For electric lighting and power, this method of wiring is consequently limited to lofts, factories and stores, and to the temporary and decorative lighting.

In knob and cleat installation the journeyman screws or nails on walls, solid or split porcelain knobs to support the wires. He fastens the wires under tension to the knobs, using wires for the purpose when solid knobs are employed, or securing them in grooves in the knobs when split variety is used. When cleats are used, he nails, screws or bolts them in position and fastens the wires in the grooves between the cleats. He screws porcelain receptacles on surfaces where they are required, strips or "skins" insulation from "spots" on the wires, and fastens this bare part of the wire to the screw terminals of receptacles. He makes joints and taps, soldering, taping and painting over the tape and connects wires emerging from porcelain, molded mica, or black composition weatherproof sockets to bared circuit wires.

On concrete and brick ceilings and side walls he drills holes with star drills, plugging the holes with expansion shields to provide points which will hold screws or nails. He sometimes attaches insulator supports to angle irons. He fastens cables to large insulators, using block and tackle when necessary to secure the required tension. He makes splices and taps cables, or joins cables with sleeves and connectors made for this purpose.

He installs and sets cut-out and panel board boxes, runs feeders to them, and solders the feeders into their lugs. He runs circuits to the panel board circuit switches, or cut-outs, strips the insulation from a portion of the wire and connects them under the screw terminals. He must know how to cross over gas, steam and water pipes, as well as wires of other circuits, or of opposite polarity, and how to "dead end" cleat and knob work properly.

SETTING AND CONNECTING SWITCHES AND RECEPTACLES

The journeyman "skins" the insulation from the circuit wire ends in the switch outlet boxes, and tests with bell and battery the circuit from the switch outlets to the light outlets. He makes twisted wire joints, solders and tapes them, presses them back

into the switch box and connects the ends of the circuit wires to be controlled by the switch with the screw terminals.

Pressing the porcelain cup containing the switch mechanism into the switch outlet boxes he makes the face flush with the plaster surface, places washers around supporting screws, and then screws the whole firmly into tapped switch outlet boxes. He installs single pole, double pole, three and four way, two and three point electrolier switches of the snap and push button types, automatic door switches and momentary contact switches for remote control. He also sets flush switch plates and screws them to the lugs provided for the purpose on porcelain cups. He must know how to test out wires for single pole, double pole, three and four way, two and three point electrolier switches and momentary contact switches for remote control. He must know how to back out switches flush to the plaster surface, fasten the switches singly and in groups, and finish them with plates. He must be familiar with methods of installing receptacles in wall, base board and floor outlet boxes for portable lights and heating devices and understand the Electrical Code provisions governing installation of switches and receptacles.

INSTALLING PANEL BOARDS

TESTING AND CONNECTING CIRCUIT WIRES

The journeyman sets panel board or slate tablet, in the middle of the panel box, fastens it with screws, or stove bolts, and adjusts the slate gutter barriers with corner fittings, either screwing or bolting them. The barriers in the panel box are fitted around the panel board and the journeyman tests out the wires from the panel box to the first outlet with bell and battery, assisted by the helper stationed at the outlet. The journeyman "skins" the insulation from the wire ends; bends them around "clockwise" under the screw terminal nuts of the circuit switches and screws the nuts down tightly.

Next he tests and joins the wires according to the loop system, so as to obtain a continuous wire from the panel board to the outlet terminating each circuit. He then solders or "sweats" the feeders into lugs and connects them to the bars of the panel board. Completing the work, he sets and fastens the trim of the panel box, consisting of door and frame.

The journeyman should understand the Electrical Code requirements governing panel board installations.

FIXTURE HANGING

The journeyman installs straight electric and combination gas and electric fixtures on ceilings and side walls. When necessary he extends fixture studs, gas pipe or drop ells inside of outlet boxes, shortens them with hack-saw and stock and dies, or with outlet cutter or facing tool, and cuts new threads with wall die.

He tests circuit wires with electric bell and battery, where this work is not done by the wireman, for connection of fixtures with single, double, three and four way, two and three circuit electroliers, and automatic door switches.

He "skins" insulation from wires emerging at outlet and fixture, covers gas pipe, if any, with circular loom tubing, finishes gas pipe connection with sealing wax, white lead or asphaltum paint. After hanging or setting the fixture he connects the wires to outlet wires, making a twisted joint, solders and tapes the joint with rubber and "friction" tape, or applies an approved insulated connector. He assembles parts of large fixtures on the job and connects wires in side, repairs French fixtures, crystal electroliers and brackets.

He should be familiar with the Code provisions covering fixture work, and should understand the construction and assembly of fixtures; methods of wiring and installing French and crystal fixtures; and the use of insulated connections. He should know the sizes and carrying capacities of wires. Furthermore, he should have skill in testing and assembling and installing fragile fixtures.

BELL SIGNAL WIRING

For apartment hall bells the journeyman bores $\frac{3}{4}$ inch holes straight down through floors and ceiling plates from the top floor to cellar. He bores holes through partitions and rough studding. With the assistance of a helper he draws weatherproof wires, or duplex office wires, through the holes down to the cellar, pulling out and leaving a loop at each bell and push button outlet. He draws a duplex wire from the push button outlet to the bell outlet on each floor, and twists wires around large nails at these outlets to hold until the plastering is finished. He draws wires through a rigid conduit, when going through brick or concrete walls or ceilings, and tapes wires together when they are in contact with brick walls.

For vestibule entrance, dumb-waiter call bell and door open-

ers in apartment houses, he draws weatherproof wires, or a duplex office wire, from the outlets in the apartments to the cellar. With the aid of his helper he picks up and tests all wires in cellar, extending them covered with tape on the cellar ceiling to vestibule, to dumb-waiter shafts and to battery box, or bell-ringing transformer box.

He "skins" insulation from wires at outlets, screws bells, buzzers and push buttons to walls or door casings, makes joints, insulates with friction tape, screws wires under bell, buzzer and push button terminals. The wiring having been installed, he tests for the number of batteries or size of bell-ringing transformer required. He then connects the bell and button battery wires to battery or transformer. If a transformer is used, he connects the primary terminals to electric light circuit, protected by a fused cutout. He connects automatic door opener and adjusts the bells.

He must be familiar with various systems of bell wiring and bell ringing, with different toned bells. He must understand method of calculating the capacity of batteries in ampere-hours; construction and properties of electro-magnets; qualities of various types of batteries; methods of arranging batteries in series, parallel and multiple-series; polarization and its remedies; the construction of various types of electric bells and annunciators; the utility of three and four-point push buttons and strap keys; and function of the relay in burglar and fire alarm systems.

TEMPORARY LIGHT AND POWER INSTALLATIONS FOR BUILDING OPERATIONS

The journeyman must be an all around electrician as he is called on to install rheostats, regulators, flaming, open and closed arc lights, all classes of incandescent lamps and to repair motors. He reads meters and makes tests for troubles on motor, power, light, bell and telephone equipment. All his work is exposed and liable to damage by the work of other tradesmen.

The superintendent of the building and the electrician study the plans and pick out a location for the switch board room where it may remain longest without being disturbed. Sometimes the whole service—switch board, shanty and wiring—must be changed to another location, an operation which must be accomplished without interference with the supply of power and light.

The foreman, with other electricians, builds a wooden switchboard to carry switches, meters and instruments necessary to handle the supply of current required. He sets up and connects to the service lines and meters the different switches and instruments on the board.

If derricks and hod hoisting machines arrive, he runs exposed wires from the switchboard to machines, supporting the wires with porcelain knobs and tie wires fastened to the columns, beams, woodwork, or he may lay them on the ground. He connects wires to machines and controllers. As the building construction advances different machines, such as concrete mixers, air compressors, cement gun compressors, tank pumps, riveting and drilling machines, floor polishing machines, buzz saw machines, and section pumps may arrive on the job. These machines he connects up as above described. He sets and fastens rheostats and regulators, and connects them, runs feed wires of sufficient carrying capacity from switchboard to stair wells or shafts and to the highest point of the building. Having installed his feeder risers, he sets cutout boxes on the various floors and at different locations, connecting them to feed risers. He runs branch wires and streamers from these cutout boxes through the different halls, corridors and rooms or to whatever point called for by the different trade workers on the job. This wiring is run exposed and hung wherever convenient. The journeyman connects weatherproof sockets to the branch and streamer circuits at a distance of 20 to 30 feet. He makes up portables with reinforced cord, weatherproof attachment plugs and weatherproof sockets. He installs flaming and enclosed arc lamps and incandescent lamps, trims the former, replaces the latter as they burn out, or are broken, and makes all repairs. He maintains and repairs all the motors, rheostats and regulators. He must also remove wire when called upon to do so and must see that all lights are kept burning, preventing any delay or loss of time to the different trade workers. Helpers are not employed very much on this class of work as it requires experienced men.

He should know how to estimate the current consumed by the various machines and the light and power required by the trade workers and calculate the wire sizes required. He should know the Code requirements relating to exposed wiring. He should know how to set motors and mount rheostats and regulators on walls, temporary partitions and shanties and be able to test, reverse, adjust and repair motors. He should know how to hang,

support and connect flaming and enclosed arc lamps and to adjust, trim and repair them. He should be familiar with the different classes and sizes of fuses and be able to refill them. He should know how to set and connect volt and ampere meters and understand their principles. He should be able to transfer temporary light lines to permanent panels and know how to fuse and maintain permanent panels.

In addition to the knowledge of electrical theory outlined on page 52, this worker requires a knowledge of electrical machinery and appliances, such as motors, generators, rheostat, arc lamps and regulators, as well as telephones and measuring instruments. He should understand the operating theory of motors and generators and their construction.

DECORATIVE LIGHT WIRING

The journeyman screws, nails or bolts porcelain knobs and cleats, both solid and split, to wood or iron surfaces to support wires, fastens wires under tension to knobs with tie wires, when solid knobs are used, and in the grooves when split knobs or cleats are employed. He screws porcelain receptacles to surfaces as required, strips or "skins" insulation from wires, fastens and solders bared wire to screw terminals or receptacles and paints them. He makes joints, splices or taps, soldering and taping them and painting over the tape.

He installs strain, carrying or messenger wires for outline lights, on temporary amusement structures and in streets or parks for celebrations; attaches suspension cleats and suspends ready-wired porcelain, or mica, receptacles from cleats.

He makes up festoons of electric lights with duplex stranded wire, strips the insulation from the wire, connects the wires emerging from molded mica or black composition, weatherproof sockets to duplex wires, staggering the joints, soldering, taping and painting over tape. These festoons he suspends from carrying wires. He installs approved cut-out or panel board boxes, sets the cut-outs or panel boards, runs feeders to and solders them into the lugs of the panel board or cut-outs, runs circuits to the panel board circuit switches, or cut-outs, strips the insulations from wires and connects them under screw terminals.

The journeyman must know the Electrical Code rules covering the installation of decorative lighting and open box wiring; how to fasten split and solid porcelain knobs and cleats to wood and iron supports, and how to attach wires to knobs and cleats.

He must know how to cross over gas, steam and wire pipes and wires of other circuits, or of opposite polarity, and how to "dead end" cleat and knob work properly. He must know how to install cut-out and panel board boxes, set cut-outs and panel boards, connect wires to cut-out terminals and panel board circuit switch terminals, be able to "sweat" feeders into lugs, know how to make festoons, support strain, carrying or messenger wires and receptacles therefrom.

ELECTRICAL SIGNS AND FLASHERS

In the shop where signs are built the electrician sets the porcelain sign lamp receptacles into the holes punched out of the sheet iron and fastens them with brass screws. Following a wiring diagram he "skins" insulation from rubber-covered No. 12 or No. 14 gauge copper wires and fastens them with a screw driver under the screw terminals of the receptacles, being careful to keep the insulated wires from contact with the sheet iron surface or iron frame work of the sign.

After the wires have been connected, he solders them to the screw terminals to insure permanent contact and paints wired connections with weatherproof paint to prevent corrosion. He then tapes all wires together into cables to remove excessive strain from receptacle terminals, and extends the circuit feeding wires from the inside of the sign through porcelain tubes or bushings to the outside, leaving the ends long enough for connection to outside and sign flashers. Before all parts of the sign are assembled he tests all wiring and connections by temporarily inserting lamps in the receptacles.

When the sign arrives at the point of installation it is erected by expert sign hangers or erectors. The electricians then firmly connects all leading-out wires to the terminals of the switch brush contacts of the sign flasher which he has previously installed, enclosed in a sheet iron weatherproof box, near the sign. He runs all conduits and feeders from the power company service to the flasher and connects these to cut-outs on flasher box.

When all connections are completed the electrician screws the lamps into receptacles, lubricates the flasher switch shoes and brushes, adjusts both so that they will make and break contact properly and avoid excessive sparking, oils the bearings of flasher and motor gear transmission bearings, and tests the entire equipment for grounds, open and short circuits. He corrects any defects before placing sign in commission for regular operation.

He should be familiar with the Electrical Code requirements for sign and flasher installations; how to read blue print diagrams and rough sketches; calculate the current consumption of signs; balance the load on the three-wire Edison system; and determine the size of wire to be used. He should know how to connect the receptacles in parallel and multiple series.

He should know, furthermore, how to test the lamp bulbs while inserting them into the receptacles; how to lubricate and oil all parts of the flasher equipment; time the make and break of brushes on switch shoes; and test the completed sign installation and place it in commission. Finally, he should know how to repair signs and flashers and readjust shoes and brushes to secure the changeable and spectacular effects demanded in specifications.

In addition to the knowledge of electrical theory outlined on page 52, this workèr requires a knowledge of the design and construction of small motors and methods of detecting and correcting motor "troubles."

He should also be familiar with the construction and operation of various types of signs, changeable and spectacular sign effects and the different kinds of sign flashers, apparatus and control devices.

POWER PLANT INSTALLATION

In the installation of large power plants, a consulting engineer is usually employed who is responsible for the work. He prepares the detailed plans and gives instructions concerning the installation of the equipment: machinists, carpenters, riggers and concrete workers as well as electricians are employed on large jobs.

In the installation of small plants the electricians usually have full charge of the work and secure such assistance as may be necessary.

In new power plant installation the generators are generally directly connected to shafts of engines. Here the foundations are built for the erection of combined engine and generators on one bed-plate. The generators are delivered completely assembled, or with assembled magnet frame and armature separate. If the generators are completely assembled he directs the coupling of the armature shaft to the engine shaft, but if they are in parts he directs the setting of the magnet frame in position on the bed-plate, supervises men using the hydraulic jack to force

the armature on the engine shaft, sees that the armature is thrust inside of the magnet frame, and the shaft connected to the engine.

He bolts the generator to the engine bed-plate, levels and aligns both, and attaches brush holders to the studs on the brush holder rigging. He connects the shunt and series field leads to their respective terminals, and the armature leads from the brush holder studs to their proper terminals. He attaches the oil gauge cocks, or automatic oil feeder equipment. He erects balancing sets in conjunction with lighting systems, and the boosters for storage battery charging.

Alternating current generators are installed in the same way as described in the foregoing, but require for their operation a separate source of direct current for field excitation. A small direct current generator, called an exciter, is provided for this purpose. The worker installs the exciter on a separate foundation and connects the pulley on its armature shaft by a belt to a pulley on the generator. In the best modern practice an engine or motor driven exciter, directly connected, is set upon a foundation, or the exciter is made a self-contained part of the alternating current generator.

Rotary converters and motor-generators are placed on foundations, in the same manner as for generators, and constant current and constant potential transformers required for operation in conjunction with alternating current power and lighting equipment are installed in similar manner. The worker also provides foundations for and sets the electric motors for driving exhaust and fresh air supply fans, vacuum cleaner apparatus, air compressors, water, oil and boiler feed pumps.

The electrician receives detailed drawings for switchboard installation. As the slate or marble sections, equipped with switches, circuit-breakers and their bus-bars, arrive from the manufacturer, he assembles the sections on the frame work he has erected, and levels the entire switchboard. Those devices and bus-bars that are not mounted at the factory, he mounts on the front and back of the switchboard. These are usually the manual and automatic voltage regulators, oil brake switches, time limit relays, reverse current relays, lightning arresters, ammeter shunts, ground detectors, volt-meter switches, ammeters, voltmeters, frequency meters, power factor meters, speed indicators, synchrosopes watt-hour meters, potential transformers, current

transformers, graphic meters and fixtures used for illumination of the switchboard and instruments.

He consults the detailed drawings and makes all back connections of bus-bars, studs, nuts and bus-bar clamps provided to combine all sections into a complete switchboard; connects all switches, apparatus, devices and instruments mounted on the face of the switchboard to bus-bars; connects the cables from the generators, rotary converters, transformers and storage batteries of proper switches, circuit breakers or fuse terminals, into the lugs of which the cables are soldered. In the same manner he connects power and lighting distribution and feeder cable to switches. He connects the motor leads and feeders to control the devices and apparatus mounted on separate switchboards.

When installing storage batteries of the lead-lead type, the variety generally used in power plants, he carefully unpacks the elements and cleans off all foreign matter, assembles with separators and scrapes the extending straps of the positive and negative elements with a file or knife, to provide good contact when cells are connected. The combined elements are then ready for placement in the jars or tanks. When the assembled plates are small and few in number he lifts them into the jars with the aid of canvas webbing 4 or 5 inches wide placed around the assembly. He withdraws the webbing when the plates are properly inserted. If the plates are larger and more numerous, two "S" shaped iron hooks, caught around an element and looped over a rod carried by two men, are used. In the case of very heavy plates, a traveling crane is employed for the lifting and lowering of elements into jars or tanks. In connecting the cells, the battery straps are fastened to each other with clamps or bolts, or by burning or welding them together with the aid of the hydrogen flame of a lead burning outfit.

The cables from the switchboard are soldered into lead covered lugs for connection at end cell points, and at both ends of the series of cells comprising the battery. The cables and connections are then coated with paraffin wax, or sulphuric-acid-proof paint, to prevent local corrosion. Until the plant is prepared to charge them, the cells are covered. Twelve to fifteen hours before this time the electrician pours, or syphons, the battery solution or electrolyte into the jars or tanks.

After all machines and control apparatus have been erected, mechanically and electrically connected, the electrician and chief engineer place the plant in operation for a trial run. During

this period all necessary adjustments, such as changing the polarity of direct current generators for operation in parallel, adjusting the series field shunts so that each generator will take its proportional share of the load, adjusting the governors of the engines to make parallel alternating current generators operate in synchronism, and, if necessary, changing the battery cable connections on the back of the switchboards. If the trial run is satisfactory, the usual efficiency tests called for in the specifications are made, in which the electrician assists. During this operation the entire power plant is tested to prove that it will do the work required by the specifications.

For such work the electrician should understand the Electrical Code provisions covering power plant installation work, and those of the Building Code relating to stability of foundations. He should be able to interpret plans, detail drawings and specifications. He should know how to level and align generators with engines, and other rotating machines and apparatus.

He should understand the operation of direct and alternating current generators, motors and apparatus found in power plants, and he must be able to recognize and remedy the troubles of direct current generators, such as sparking at the brushes, heating of armature coils, field coils and bearings, noises, too high or too low speed, reversed residual magnetism, weak residual magnetism, short circuit in the machine, short circuit in the external circuit, opposed field coils, open circuit, overload, excessive resistance of field rheostat, etc. He should also be able to recognize and remedy similar troubles in alternating current generators as well as in direct current motors.

He should know the capacity of the battery being installed, the charging and discharging rate, the maximum and minimum voltage per cell on charge or discharge; the composition of the electrolyte, and how to take its specific gravity and temperature. He should be able to make the electrolyte when necessary. He should understand the maintenance and care of batteries and methods of locating and correcting troubles, and how to place a new battery in commission.

The electrician should know how to start the plant, assist in efficiency tests and have a sufficient general knowledge of the apparatus and its operations to instruct the engineer employed to take charge of the completed plant.

ELEVATOR SIGNALS (THE UP AND DOWN SYSTEM)

From the plans and specifications furnished the worker learns what signals, telephones, megaphones, threshold illuminators, switchboards, position indicators and machine generators are to be installed and their locations in the shafts.

From the riser list and specifications he obtains the measurements between floors from the basement up to the machine located on top of the building for the upriser, down riser and the push button riser lines, each of which is independent of the others. The conduit is then cut, threaded and coupled into lengths according to these measurements. He marks each coupled length with chalk to indicate its location in the shaft and on the floor, and hoists or carries and distributes the conduits to their respective shafts and floors. The conduit is then placed, hung and fastened to the "I" beams in shaft with specially made clips. A 4" gap is left between the end conduit lengths at each floor to provide for a 4" split "tee". These split "tees" are then attached after all the wires are pulled in and tested. At all the elevator landings, a ½" conduit is installed from the split "tee" gap of the push button riser to the push button location, and fastened with pipe straps and machine screws.

At elevator landings over the doors, the worker installs dials, indicators, fixtures and very often he has to cut openings into the iron grill work, using a breast drill, electric drill or acetylene burner.

After hanging a single sheave pulley over the top of the riser lines, he passes the ends of wire through the sheave and attaches a chain, for use as a weight, to ends. He drops the wires into the conduit riser until they emerge at the end of the basement. He then cuts the wire at the top and allows the end of the coil to drop down the shaft outside of the conduit to the bottom where it is connected by another worker with the end of the wire dropped into conduit. He makes the same connection at the top, thus providing a complete wire loop. He then uses this loop for pulling the other wires into the conduit riser. This endless drag line facilitates the rapid pulling of the separate wires, each being attached to drag loop as it reaches the top of the riser.

The first wire to be pulled in from top to bottom is a No. 14 with a white covering to be used as a feed wire to lanterns. Another wire is attached to the drag loop and that is pulled in from top to bottom, this is the up wire of the first floor and is

cut after allowing enough at both ends. Then one duplex wire is pulled in from the top to the second floor, top to third floor, top to fourth floor, until a duplex and the white covered feed wire emerge at each floor, and the wires are allowed to extend enough at each end for connection to lanterns and the signal machine.

Then two extra duplex wires are pulled in from the top to the center of the shaft. These are for lights and signals in the car. Taps are then made to the feed wire and section wire, they are tested and pulled through to the lantern fixtures, and connected on 110-volt feeders. The split "tee" fitting is then clamped fast with machine screws over the riser lines and $\frac{1}{2}$ " conduit running to lantern outlet. The push button riser is installed the same as the up-and-down conduit riser. Only one conduit riser is installed for a set of adjoining shafts. This wire is connected to the control board after being tested. The electrician then installs and connects the up-and-down fixture lanterns and the up-and-down push buttons.

A five wire traveling cable is next fastened and dropped down from the center shaft, allowing enough for a loop at the bottom, fastened beneath the car platform and run up into the car. The electrician drills holes into the center of the secondary sheave shaft on the elevator machine, taps the holes and attaches a friction stud and sprocket; this, connected by means of a linked belt, drives the signal machine.

The electrician then constructs an angle-iron frame, mounts the control board on it, runs the conduits between the control board, signal machine, motor generator, set and service panel. Wires are then pulled into these conduits.

All individual wires are tested and tagged in order to identify the up wires and the down wires to the lanterns, push buttons and the car cable. The wires at the control board are connected to the control board switches and mercury pot magnets. The wires from the up-and-down lanterns are now connected to the signal machine and the contacts on it spaced and set for different floors.

The electrician makes a general test to determine whether the wires are connected accurately and free from grounds or other defects.

Finally, the fixtures are lamped, the current thrown on, and a trial trip made on elevator car to see that all is in proper running order. When position indicator boards are installed, another signal machine of left-handed commutator type is installed

at the bottom of the elevator shaft, the commutator is connected to a grooved pulley attached to the shaft of the signal machine by means of steel tape. Conduit from the signal machine at the bottom of the shaft to the starter's office is then installed.

The position indicator board is set, No. 16 section wires for up-and-down movement of the car to each floor are pulled into the conduit and connected to proper contacts on the bottom signal machine and to connections on position indicator board, starter's control system desk and auto-motor generators located in the starter's office.

The position indicator board is then lamped with miniature lamps numbered in rows representing the different cars and floors in each shaft.

In addition to the general knowledge of an all around electrician, the journeyman employed upon this work must thoroughly understand the operation of the signal systems in theory and practice and be able to interpret specifications and diagrams relating to the same.

In addition to the knowledge of electrical theory outlined on page 52, this worker requires special knowledge as to the effects of corrosive action upon wires and conduits and methods of preventing the same.

ELEVATOR CONTROL

The work of installing electric elevators is usually done by men supplied by the manufacturer of the elevators. These men are usually trained electricians and mechanics who are able to do all the work necessary in connection with the installation of the elevator.

In this work the journeyman installs the machinery that is built at the factory; comprising the car and counterweight guides, the under mounted drum, or over mounted traction machinery and brake equipment, and the motor and controller. A blue print wiring diagram is generally furnished which shows the connections of the system of control.

The workman installs all conduits in the elevator shaft, fastening them from bottom to top to the structural iron work, using pipe straps and machine screws. At intervals of 125 feet up the shaft, he sets and fastens junction boxes containing connection blocks, designed for the purpose of relieving the strain on the wires. In addition to these he installs others wherever required

to make connection with the operating cables and switching devices when necessary. He drills holes in the steel beams with an electric drill and taps these for fastening the conduits and boxes.

After the conduits have been installed in the shafts, and the car has been assembled, a junction box is set and fastened beneath the car platform. From this box a conduit is run to the car switch, the safety switch and the gate contact boxes, as well as to the stopping switch on the top of the car, using special split threadless elbows, tees and boxes where bends and junctions are necessary.

The conduits in the shafts are extended to the controller board and from there to the motor, magnetic brake and an additional car switch located in the motor room, and holes drilled and tapped for fastening straps with machine screws.

When the conduits have been installed, the worker estimates the number and lengths of wires required to run from the controller board to the junction boxes and devices, slices and notches both ends of each wire for identification, and pulls the wires into the conduits with a "snake".

He then strips the insulation from the ends of wires, turns the bared ends into rings, which are soldered so as to form a lug, and fastens them under washers and nuts at the proper screw terminals. This he does at every junction connecting block, on the governor switch, on the controller board, on the door contacts, if any are provided, on the car switch located in motor room, as well as on the emergency limit switches which he then places and sets at the bottom and top of the elevator shaft.

All of the smaller wires now being in place and connected the feeder wires are installed from the main line switch to the main fuse terminals on the controller board, from the controller board to the safe lift throw over switch, and to the by-pass maximum and minimum starting resistance. The armature and field-coil leads, the wires for the magnetic and auxiliary brakes and slack cable switch are pulled in, prepared and soldered into copper lugs and the lugs fastened to their proper terminals at both ends.

The journeyman takes measurements for the car control cables, drops them into the shaft from the junction box half way up the shaft and fastens the stranded wires to their proper screw terminals. This operation is repeated in the junction box be-

neath the car platform, on the car switch, stopping switch, the switch mounted on safety plank and on gate contacts. All of these wires are coded according to colors and combinations of letters and numbers, supplemented with polarity signs where direct current is used for power.

After all the wiring has been installed, the electrician makes all tests required with test lamps to prove that connections are correctly and firmly made, and assists the engineers in conducting the running and lifting tests.

The skilled elevator electrician does all of the wiring and connecting of the equipment, except the building of the controller, which is built and wired completely at the factory. He should know the "safety first" rules and how to observe them, and the Electrical Code requirements covering electric elevator equipments.

He should know the color codes, combinations of letters and numbers supplemented with polarity signs, or he should be able to devise a code of notches and splices to identify the large number of electric conductors.

He should be familiar with the elementary principles of motor and magnet switch design to distinguish the symptoms of reversal of polarity, grounds, short and open circuits, and he should know how to remedy defects.

In the event of the elevator failing to operate he should know how to make adjustments on elevator engine and brake, the car switch, stopping switch, upper and lower emergency limit switches, the governor switch, slack cable switch, safety switch, door contacts and variable resistance magnet switches on the controller and brushes on the motor, to prevent excessive sparking.

In addition to the knowledge of electric theory outlined on page 52, this worker requires a knowledge of the theory of motor operation. He should be familiar with different types of motors, types of speed control and types of electrical control used on elevators, such as non-reversible, semi-magnet, full magnet, push button, one speed and two speed. He should understand the factors that determine the horsepower of elevator motors, such as the unbalanced load to be lifted, the traveling speed of the car in feet per minute and the efficiency of the elevator system. He should understand the principles governing alternating current motors and their limitations for elevator drive and control, the principles, construction and operation of the solenoid, the magnet

switch, and dynamic brake, fuses and circuit breakers, and the types of field and armature resistance used on controllers.

MARINE INSTALLATION

From plans, specifications, sketches and instructions received from the marine architect or an officer of the vessel, the journeyman on marine work learns what is required and lays out his work accordingly. He cuts or drills holes through iron or steel decks or partitions, wherever conduit runs are to be installed by means of breast, or electric, drilling machine, or acetylene burners. He bends the conduits so that the turns will be gradual and at the same time conform to the needs of construction. Very much of the work aboard vessels is exposed and the installation must be done neatly. When it is necessary to run conduits through decks, he cuts a long thread on the conduit and passes it through the bored holes in the deck, making the points of entry water tight by means of locknuts, lead washers and red lead. This matter is very important in all ship installation.

In some parts of the vessel conduits concealed above deck ceilings are installed. All work is made waterproof by using marine fitting boxes, deck tubes and gaskets, and red leading all coupled joints on conduit runs. It may be necessary to run lead covered wire exposed beneath decks and on bulkheads from outlet to outlet and switch receptacles, to switch panel and switchboard, bending and curving it to fit. In fastening the wire at short distances, lead, iron or wood cleats are used. When conduit runs are installed either lead covered or rubber covered double braid wire is pulled in as explained under the heading "Wire Pulling".

The wireman installs all deck, pilot, signal, telegraph, staff, search, overhead and bulkhead light and fixtures, as well as automatic running and light indicators. He sets, fastens and connects water tight cut-out panel boxes and boards at different locations, and from these runs conduits and lead covered cables, concealed and exposed, to the switchboard in the engine room. He erects angle iron frame work in the engine room and on this sets and fastens the switchboard to which he connects all feed lines. He places, sets, fastens and connects up all dynamos, motors, starters and regulators aboard the vessel, and runs double braid rubber covered and lead covered wire between different points for bells, signals, annunciators, telephones, telegraph and

all instruments connected therewith. Finally, he tests, fuses and tries out all work before leaving the completed job.

The journeyman should be able to read plans, specifications, lists, sketches and diagrams and to make measurements from these and lay out the work. He should know the names, place of installation and use of the different marine boxes, fittings, wires, fixtures, apparatus, devices, instruments and machines used in electrical equipment aboard vessels. He should understand the different ground, 2 and 3 wire systems and the different switching systems, such as single pole, double pole, triple pole, electrolier, 3 and 4 way, solenoid and remote control. He should know how to connect, charge and test all types of primary and storage battery cells. He should be familiar with the generators used on signal work and should understand the setting and connecting of series, shunt and compound motors, of rheostats, of motor regulators, and of series, shunt and compound generators, as well as the single wire or ground return system of wiring commonly installed on foreign vessels.

In addition to the knowledge of electrical theory outlined on page 52, this worker requires a special knowledge of electrical requirements for splicing and connecting switches, panels, receptacles, fixtures, fusing and finishing up of electrical work on board ship to the satisfaction of the Marine Insurance Companies and owners. He should also be familiar with the corrosive effects of salt air and sea water upon conductors and insulating materials and the means used to prevent same.

KNOWLEDGE REQUIRED BY WORKERS IN ALL BRANCHES

Workers in all branches of the electrical trade can perform their work more or less effectively if they possess the required skill and understand trade methods and requirements. In order, however, to thoroughly understand their jobs and to prepare for advancement to foremen or other supervisory positions, or to other branches of the trade requiring an intelligent grasp of principles, a knowledge of the fundamentals of electrical science, together with certain elements of mathematics and drawing is essential. The extent of this need varies considerably in the different branches analyzed above. The following elements, however, are needed by all workers who expect to master their trade or prepare themselves for advancement.

MATHEMATICS

Understanding of the processes of arithmetic through common fractions with ability to compute readily with common fractions to $1/64$ and with decimal fractions to $1/1000$.

Understanding of the simple algebraic equation as represented by Ohm's Law and ability to transpose same so as to calculate the resistance and carrying capacity of conductors, whether in simple series or parallel circuits.

DRAWING

To make simple freehand sketches for wiring diagrams, floor plans and constructive details;

To make and read simple working drawings;

To understand the standard symbols used on plans and diagrams.

ELECTRICAL THEORY

The practical units of current, voltage, and resistance;

Ohm's Law;

Measurement of current and voltage by means of ammeter and voltmeter;

The measurement of resistance by means of ammeter and voltmeter, and by means of Wheatstone's bridge;

The equivalent resistance of conductors in series and parallel circuits, and how the current and voltage divides in such circuits;

The meaning and use of circular mil and mil-foot;

Computations of resistance of wires from their dimensions and specific resistances;

The practical units of power;

Measurements of power by means of ammeter and voltmeter and by watt meter;

The use of watt-hour meter;

The calculation of total power in a circuit, the power lost in line, and the relation of power loss to diameter of conductor.

The current carrying capacities of conductors for different sizes and conditions;

The theory and operation of the three wire system;

The operation of switching apparatus, including fuses, circuit breakers, and remote control switching;

Methods of using wire tables and hand books;

The Electrical Code requirements.

SKILL REQUIRED FOR ALL WORKERS

Expertness in handling the common tools employed in the trade, and such special tools called for by particular requirements;

All wiremen must be able to "skin" the insulation from wires without damaging the conductor, and make, solder and tape joints. They must be able to test out circuits for identification, and to locate grounds and open and short circuits.

SUMMARY OF THE TRADE STUDY

The findings indicate a comparatively new trade with a moderate number of workers (6815), distributed throughout the entire city in many small shops as well as in a number of large organizations; a trade constantly increasing in numbers and importance and characterized by frequent improvements in methods and material.

They show an industry in which standards set up by the building code and the underwriters' rules enforce various technical requirements as to quality of work and materials employed and furthermore one in which an employer must obtain a city license granted only upon examination in order to conduct a business.

They also indicate a trade with a working system of trade agreements providing for the settlement of disputes through a joint trade board organized by the employers' association and the union and one in which good wages are obtained and fairly steady employment is the rule.

They indicate a situation where the workers' effectiveness depends, more, perhaps, than in any other trade, on knowledge rather than skill—in this case a knowledge of certain scientific facts and technical methods of procedure.

They represent a trade with a well organized apprentice and helper system, receiving boys at 16 years of age in which both apprentices and helpers receive exceptionally good wages and in which advancement in grade is dependent on passing technical examinations conducted by a committee of the Electrical Workers' Union.

They show a situation in which the road of advancement is open to the man of intelligence and ambition to the status of the small employer, who in this case requires comparatively small capital.

The findings indicate clearly that in this trade the apprentice

and helper cannot obtain in the ordinary practice of his work the scientific and technical knowledge needed to comprehend and intelligently perform the more responsible duties of the competent journeyman.

They also indicate that unless the apprentice and helper serve in a considerable number of shops it is not possible for them to secure a practical mastery of the various branches represented in the trade. In this connection it should be noted that the unions make an effort to insure this breadth of experience on the part of the apprentices and helpers as far as possible by supervising their employment and by conducting the examinations referred to above.

Because of the extent of scientific and technical information needed, the situation seems one in which pre-employment courses for boys before the age of 16 years would be of much assistance in preparing for effective entrance to the trade. For the same reason the industry appears to be one in which trade extension courses, arranged for the special needs of the apprentice, the helper and the journeyman, would be of particular value.

OUTSIDE AGENCIES FOR THE TRAINING OF ELECTRICIANS

SCHOOLS ESTABLISHED BY THE BOARD OF EDUCATION

DAY VOCATIONAL SCHOOLS

The Board of Education of the City of New York has established trade preparatory courses in electrical work in three vocational day schools. The courses are open to any boy fourteen years of age who either is a graduate of the elementary schools or who can show that he is prepared to take the work by successfully passing an examination given by the principal of the school.

The day school courses are two years in length. The pupils spend about one-half their time in shop work and the remaining time in related work in drawing, applied mathematics and science and general courses in English, history and industrial geography. At the time of the survey in March, 1917, there were 410 boys enrolled in the electrical courses in the three day vocational schools. Two hundred and twenty of these boys were registered at the Boys' Vocational School; 103 at Murray Hill Vocational School and 87 at Brooklyn Vocational School.

BOYS' VOCATIONAL SCHOOL

The shop work in the electrical department in this school is divided into five divisions, as follows: (1) bell, annunciator and burglar alarm work; (2) telephone work; (3) light wiring; (4) motors, dynamos, generators and storage batteries, and (5) flash sign operating. A boy spends a term in each of the first three divisions, a half of a term in the fourth division, and also half a term in the fifth division. The first term boys spend three periods a week in the wood shop and the third and fourth term boys spend two periods a week in the plumbing shop wiping joints and splicing for lead and case work.

The number enrolled in this department was large enough to make it possible to secure a satisfactory classification and grading of the pupils for the shop work, and for the work in drawing and related mathematics. It also permitted the school to secure

pecially trained teachers for the different branches of the trade.

The equipment provided for the electrical department of this school was the most complete of any found in the day vocational schools. It was, however, not entirely satisfactory, from the standpoints of comprehensiveness and quality, for this kind of work.

The shop work consisted largely of exercises and problems in bell, annunciator, burglar alarm work, telephone work, light wiring, storage batteries, motor, dynamo and generator work, and sign flash operation. The advanced boys performed the repair work in the school building. This work usually consists of repairing telephones, bell systems, lighting systems, motor connections and the installation of bell and light wiring systems.

There were six teachers of electrical work employed in this school at the time of the survey. These men were all journeymen electricians and had had at least five years of successful experience in electrical work.

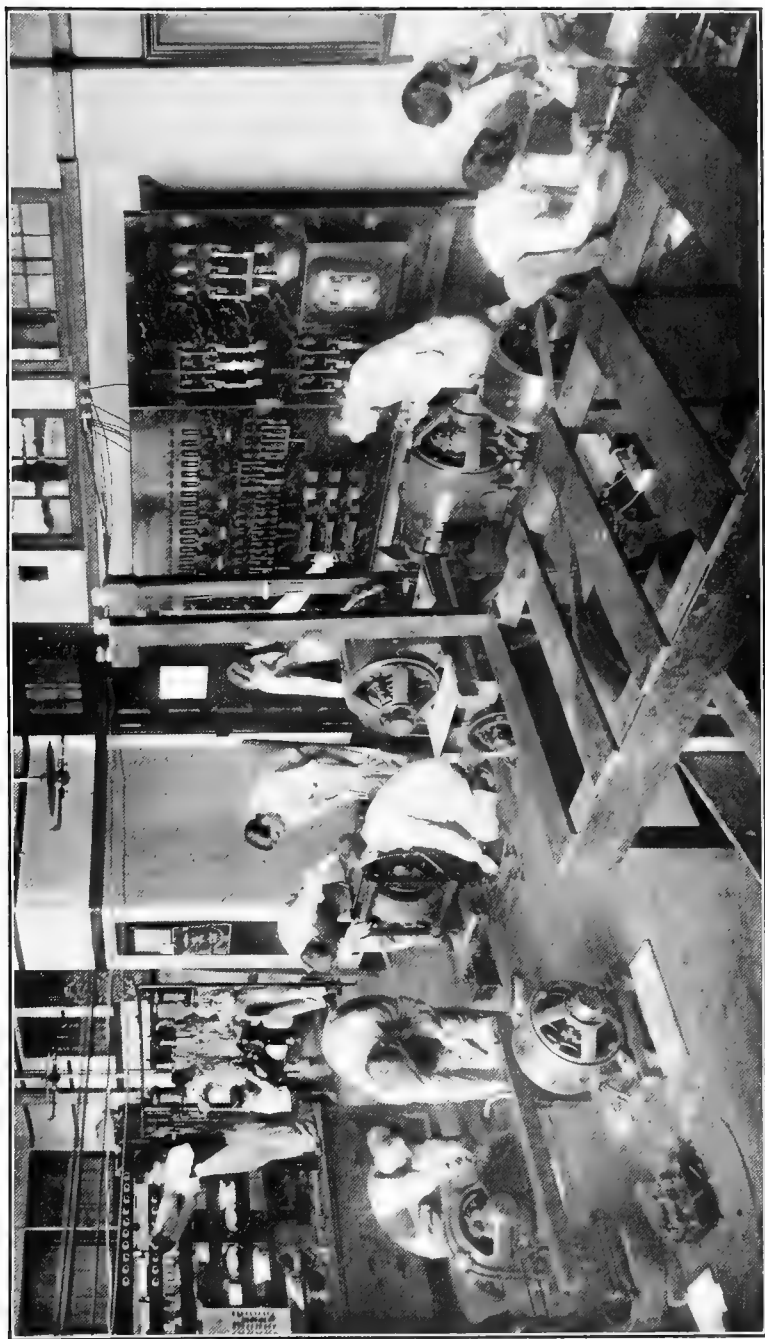
There were two instructors who devoted all their time to instruction in bell, annunciator and burglar alarm work. One instructor was assigned to telephone work, one instructor to light wiring, one instructor to motor work and one for sign flash operating.

MURRAY HILL VOCATIONAL SCHOOL

The electrical work in this school consisted largely of exercises in bell, annunciator and burglar alarm work, and the working out of problems in light wiring. The very limited equipment provided made it impossible to offer shop courses in motor, dynamo and generator work, telephone work or extensive work in sign flash operating. The boys in this department performed the electrical repair work in the school and installed the bell and light wiring in one of the annexes.

At the time of the survey there were two teachers of electrical work. Both of these men were journeymen, and had had over five years experience as journeymen electricians.

The number enrolled in the electrical department of this school is not large enough to warrant the employment of instruc-



CLASS IN ELECTRICAL WORK—VOCATIONAL SCHOOL FOR BOYS

tors with special training in electrical work to teach the related work in drawing, shop mathematics and applied science.

For these classes the boys in the electrical courses were grouped with boys from other trade departments, and as a result, the instruction was necessarily somewhat general in character. This is shown clearly in the course of study for mechanical drawing for electrical workers, given in the report of the survey of this school.

BROOKLYN VOCATIONAL SCHOOL

The number enrolled in this school in the electrical department was less than the number enrolled in the Murray Hill School. The shop work is practically the same as the work described for the latter. The equipment, however, includes several motors and the boys were given instruction in this branch of the work. At the time of the survey, one instructor was employed who had charge of two shops and the work was much handicapped by the size of the classes under his charge. The instructor was a journeyman electrician who had had over five years of practical experience at the trade. The organization of the related courses in this school was practically the same as that described of the Murray Hill School, and was conducted under the same limitations.

EVENING TRADE SCHOOLS

The Board of Education has established trade extension courses in electrical work in eight evening schools. Under a rule of the board which became effective in the fall of 1916, the attendance in the evening trade classes is limited to men and women who are employed in trades during the day. This rule, however, did not apply to those already registered in trade classes and these pupils were permitted to continue in the classes as long as they desired. The occupations as given by 487 of the men in the evening electrical classes are given below.

OCCUPATIONS OF MEN ATTENDING ELECTRIC WIRING CLASSES

Assistant Engineers.....	1	Machinists	12
Auto Engineers.....	3	Mechanics	9
Brush Makers.....	1	Organ Builders.....	2
Clerks	49	Packers	1
Clothing Makers.....	4	Perfumers	1
Chauffeurs	3	Photographers	1
Cutters	1	Picture Framers.....	1
Carpenters	3	Piano Makers.....	2
Drivers	2	Plumbers	1
Draftsmen	1	Porters	5
Electricians—		Printers	6
Journeyman	34	Press Hands.....	1
Helpers	220	Repair Men.....	1
Apprentices	60	Roofers	1
Elec. Machinists.....	3	Salesmen	2
Elec. Supplies	2	Shopworkers	1
Electro Platers	1	Silversmiths	1
Elevator Operators.....	6	Stationary Engineers.....	4
Elevator Repairers.....	5	Steam Engineers.....	1
Engineers	3	Surgical Instrument Workers..	1
Errand Boys.....	1	Téléphone Operators.....	5
Expressmen	1	Telephone Installation.....	3
Housemen	2	Tinsmiths	1
Instrument Makers.....	3	Trunk Manufacturers.....	1
Janitors	8	Typists	1
Laborers	1	Waiters	1
Laundrymen	1	Wiremen	1
Longshoremen	1		

At the time of the survey, evening trade extension courses for electrical workers were offered in the following schools:

Bushwick Evening Trade School

Harlem Evening Trade School

Long Island City Evening High and Trade School

Murray Hill Evening Trade School

Stuyvesant Evening Trade School

Public School No. 67 (Manhattan)

Public School No. 95 (Manhattan)

Public School No. 5 (Brooklyn)

On March 28th, 1917, 1286 men had registered in the evening electrical classes. These men were distributed as follows:

Name of Course	Number Classes	Total Number Registered
Applied Electricity.....	5	171
Electrical Engineering.....	2	65
Electrical Wiring and Installation.....	25	1000
Municipal Electrical Theory.....	2	50



CLASS IN ELECTRICAL WORK—BROOKLYN VOCATIONAL SCHOOL

The members of the survey staff visited twenty-five evening classes in electrical work. As is pointed out in the description of the work in the evening trade school report, over 50 per cent of the students enrolled in these classes were nineteen years of age or under, and practically 50 per cent of the students had worked only one year or less at the trade. No one class visited was made up entirely of electricians, and no attempt had been made to put apprentices, helpers and journeymen in separate classes. One class in advanced electrical work was composed of eight clerks, one brush maker, one clothing maker, one chauffeur, one cutter, and eleven electricians. The occupations of the students in another class in electric installation were as follows: one piano maker, two house men, one plumber, three clerks, two organ builders, one shop worker, one stationary engineer, one garment worker, one mechanic and power house worker, one carpenter, one elevator operator and five electricians.

The work in electrical wiring and installation consisted largely of working at simple problems in bell and light wiring. The equipment in most shops was very limited. In a number of instances, special rooms had been fitted up in the basement or in ordinary class rooms and were used for the work in electrical wiring and as a result it was necessary in a number of cases to remove the wiring boards and other equipment from the room at the end of each session. The instruction in electrical work was the farthest from real trade extension work of any of the work noted in the evening schools. This was partly due to the fact that a large percentage of the men were not engaged in electrical work and no attempt had been made to organize the evening electrical classes to meet the needs of definite groups of trade workers.

At the time of the survey there was very little evidence of co-operation between the Unions or the Employers' Associations and the administration of the evening classes in electrical work. This lack of co-operation may explain in part the unsatisfactory organization of this branch of the evening school work.

SCHOOLS UNDER PRIVATE AUSPICES

THE BARON DE HIRSCH TRADE SCHOOL provides day courses in nine trades, including that of inside electrical wiring. Each course extends over five and one-half months; or a total of 820 working hours. Of this number 730 hours are devoted to prac-

tical work and 90 hours to correlated work in mechanical drawing and shop arithmetic. Two classes are admitted each year. The average number of graduates in this subject for the past five years was 42.4; being the largest number of graduates in any of the trades taught in the school.

The course includes instruction in wiring for bell and burglar alarm work, and for electric light and power circuits, the purpose being to give the pupil a sound working knowledge of the principles and practice of wiring in all its branches.

THE NEW YORK TRADE SCHOOL conducts three evening courses in electrical work:

Course A.—Wiring for light and power, and plan work. Two terms of six months each.

Course B.—Dynamos, motors and switchboards. Two terms of six months each.

Course C.—General bell work, including bells, annunciators, burglar alarms, battery and magneto call telephones. One term of six months.

The classes meet on Monday, Wednesday and Friday evening of each week, the hours of instruction being from 7 to 9:30 o'clock. The tuition fee is \$16 for each term of six months. The school furnishes all necessary tools and materials, except drawing instruments, which the student is expected to provide. These courses are intended for young men between seventeen and twenty-five years of age.

RECOMMENDATIONS OF TRADE COMMITTEES

When the findings of the survey were completed, they were submitted to the conference committees appointed by the Electrical Contractors' Association, the Independent Electrical Contractors' Association and the Inside Electrical Workers' Union, and the following recommendations were adopted:

1. That the Board of Education establish two schools of the building trades and consolidated in these schools and the electrical equipment now used in the three day vocational schools and the evening trade schools.

2. That the Board of Education concentrates in the two schools of the building trades the day courses in electrical work now offered in the three day vocational schools. The committees further recommend that the attendance in the electrical classes be limited to 400 boys, i. e., 200 in each school.

3. That the Board of Education establish part-time trade extension classes for the apprentices in the electrical trade, and that courses be given in trade drawing, applied mathematics, electrical theory, and materials and tools. The employers' committees will urge the members of their associations to send their apprentices to part-time trade extension classes for one-half day (4 hours) a week with pay.

4. That the Board of Education centralize in the two schools all the courses in electrical work now offered in the evening trade schools and organize special courses for helpers and journeymen. The committees recommended that the attendance at the electrical classes be limited to men and boys working in the trade.

The following evening school courses are recommended:

1. Blue Print Reading
2. Elementary Trade Drawing
3. Advanced Trade Drawing

4. Applied Mathematics
 5. Cost Estimating
 6. Electrical Theory for Helpers
 7. Electrical Theory for Journeymen
 8. Course in City and National Electrical Code Requirements
 9. Shop Course for Helpers
 10. Courses for Journeymen in
 - a. Low Tension Work
 - b. High Tension Work
 - c. A. C. Work
 - d. D. C. Work
 - e. Automatic Control
 - f. Sign Flashers
 - g. General House Wiring.
5. That the union require all helpers to attend the evening trade extension classes for two nights a week for two years.
6. That the Board of Education require a registration deposit of \$2.00 of all men who desire to take evening trade extension courses; that such deposit shall be returned upon the completion of seventy-five per cent. of the course.
7. That the Board of Education appoint a special advisory committee of nine members to assist in developing the courses in electrical work, such advisory committee to be made up of four employers representing employers' associations, four employees representing labor organizations, and these eight to nominate one additional member who shall be a layman. That the Board of Education consider the recommendations of this committee on the following points:
1. Courses of Study
 2. Character of Equipment
 3. Number of Pupils to be Admitted to Schools
 4. Requirements for Admission to Classes
 5. Checking the Work of School to See That It Meets the Practical Needs of the Trade.

REPORT OF ADVISORY COMMITTEES

In the report of the advisory committee on day vocational schools, the following paragraphs, concerning instruction for the electrical trade, appear:

"In the trade of inside electrical work the committee realizes that the following conditions are presented: First, it is difficult to duplicate practical trade conditions in a vocational school; second, there is a well organized apprenticeship plan in the trade and many young workers are taking evening courses of instruction that necessarily follow lines similar to those that must be dealt with in the day schools. They believe, however, that such classes are warranted if their scope is widened to include other branches of electrical work.

"The committee feels that instruction in carpentry and electrical work can most effectively be maintained in a central school for the building trades along with other courses in this field. While one such school would at first be all that is necessary, other schools of this type could be added as the need became apparent until each borough is provided."

A specialized central school backed by the interests of the trade dealing in part-time and trade extension classes and standing before the community as the headquarters of the trade, will present a situation much more likely to attract a group of pre-employment pupils who have already formed their desire to be trained for that particular trade than schools in which this trade course appears only as element among other courses.

"The contact of pre-employment pupils in such a central school with the higher processes of the trade and with the workers in the trade will exercise a strong influence in retaining their attendance for the full course of pre-employment instruction."

In the report of the advisory committee on evening schools appears the following:

"This committee heartily endorses the recommendations of the committees appointed by the Allied Printing Trades Council and the Association of Employing Printers, for the establishment of a centralized school of printing and also the adoption of

the courses of study suggested by these committees for evening trade extension classes in printing. This committee also has the firm conviction that it is advisable to bring together in one school, wherever practicable, all classes in the same field of work in order that through this larger grouping pupils may be more readily and carefully graded as to their previous training, experience and ability. This plan will tend to improve the character of instruction and make possible much better and more far reaching results than are at present obtainable. This arrangement also makes possible a larger and more satisfactory equipment than can be had under the present plan of widely distributed classes in the same subjects."

PART III

THE CARPENTRY AND JOINERY TRADE

The evolution of the building trades in the City of New York is similar to that of other large cities in this country. A pioneer period of wood construction was followed by some brick construction. This brick construction finally asserted itself in the more densely populated portions of the city, entirely crowding out frame construction in the Borough of Manhattan. The increasing need for accommodating larger and larger numbers upon restricted areas brought in the steel construction period with its soaring skyscrapers. Paralleling this evolution, especially in recent years, was the development of a code of fire prevention rules, which constantly tended to further restriction of inflammable construction. These rules forbid the erection of frame structures within the Borough of Manhattan and encourage a constantly increasing use of fire trim and other details of fire-proof construction. All of these tendencies result in making less use of the services of the wood worker, especially in new buildings in the more densely settled parts of the city. Even in the suburbs there is relatively less frame construction than in previous periods, as exemplified by the erection of miles upon miles of two-storied brick houses. A large amount of the trim of these houses is stock trim, brought into the city from distant mills.

The following table gives the number of frame structures erected in the four unrestricted boroughs during the past five years:

	1912	1913	1914	1915	1916
Queens	3,185	3,129	3,130	2,848	2,126
Brooklyn	1,880	1,186	1,324	1,061	1,258
Richmond	756	758	857	1,058	928
Bronx	237	185	176	161	88
	6,058	5,258	5,487	5,128	4,400

This table shows a marked decline in the number of frame structures. Another factor that lessens the opportunities for employment by the carpenter is the increasing amount of work

that is being turned out already assembled by the factories or ready for assembling on the job. Later in this report attention will be drawn to the high degree of specialization that the mill has attained.

IMPORTANCE OF THE TRADE

For the year 1916 alone the total cost of building operations amounted to the sum of \$198,451,702. Of the individual trades composing the building trades that of carpenters and joiners is still the most important as far as the number of workers is concerned. According to the United States Census Report for 1910, there were 41,442 listed as carpenters in New York City, the age divisions showing that apprentices and helpers were included in this number. These were divided among the boroughs as follows:

Manhattan	15,554
Brooklyn	15,441
Bronx	4,702
Queens	4,138
Richmond	1,607
	41,442

There were also 15,000 listed as building contractors. It is perhaps safe to assume that about 3,500 of these may be listed as employing carpenters, making a total of more than 44,900 engaged in erecting work.

There were, according to the 1913 New York State Industrial Directory, 10,219 men employed in the wood-working mills and cabinet shops of New York City. This number does not include the large number of workers employed in piano, furniture and other highly specialized wood-working factories.

These figures indicate that there are approximately 55,000 men engaged in the carpentry and joinery trade in Greater New York, exclusive of those engaged in ship, dock, wharf, bridge and railroad work.

It is impossible to secure information as to the value of the work done by these men. The value of all kinds of building construction and alterations for the year 1916 was \$224,285,280.

HOW WORKERS ARE OBTAINED

Supply and Demand: In the 87 shops and jobs visited, the complaint was commonly made of the lack of competent men.

This complaint was particularly emphasized in shops and on jobs doing a high class of work, especially where the work was such as to prevent specialization along narrow lines.

In these latter shops were found, as a rule, men trained abroad, or products of an apprenticeship system in this country that tended toward an all-round training, with here and there an apt tool worker with little training. Such shops are able to get along fairly well under normal conditions, but when unusual activities compel them to add to their force they are put to much expense through being compelled to employ workers of insufficient skill. These they use to an extent on specialized and minor processes. On the other hand, the number of shops devoted to machine wood working in New York is not keeping pace with the increase in population. This fact, together with the tendency toward specialization, to some extent offsets the difficulty of obtaining capable men.

Apprentices: There are few apprentices to be found today in the wood-working trade. In the establishments and jobs visited there were 18 shop apprentices among the 1,000 workers, and out of 505 workers on erecting jobs there were but 13 apprentices. The term apprentice means little because of the lack of indenture and organized training of these workers. It is a common practice to "lay off" an apprentice during the slack season in the same manner as journeymen. Consequently, these workers often take the opportunity of accepting other jobs that offer possible betterment either in salary or steadiness of employment.

Survey visits have disclosed the fact that there is little desire on the part of the employers in the better shops to employ apprentices, although these may be obtained for one-quarter the wages paid to journeymen. The opinion was expressed repeatedly that the young apprentice was wasteful, produced but little work and of an inferior quality. For these reasons the number of apprentices allowed by the unions to a shop is seldom found.

The average wood-working shop provides many minor jobs—such as cleaning the shop, caring for glue pots, simple nailing, gluing, sanding and planing—and there are few of the holding and tool chasing jobs that are common to other trades. The tool-using problems for bench hand's apprentices are simple and such as might be delegated to a low-grade mechanic. Survey visits show that little effort is being made to give the apprentices a sequential, thorough experience. New York wood-working shops

are highly specialized and afford but little chance for the young bench hand worker to acquire other than a narrow trade education.

The survey visits also showed that there were few apprentices being trained in the use of wood-working machines. As a rule the machine operators are recruited from the ranks of so-called "helpers"—men who stand at the back of a machine to "take away" and who are given such instruction at times as will enable them to become machine feeders.

Beginning on the saws or boring machines, it does not take long for the worker to acquire enough experience to use the planers. A great deal of the work in a wood-working shop does not require extreme accuracy. So the semi-skilled worker may be used effectively. As the sharpening and care of tools is usually delegated to a special man, the use of a semi-skilled machine wood worker is entirely feasible.

The great mass of work of most shops is done on the saws and planers, but the saw and planer operator with some natural ability is able to pick up enough information to enable him to set up and run special machines, such as the shaper, the moulder and the tenoner. The sharpening or forming of cutters for these takes longer to learn, and in many shops is learned by "hit and miss" methods.

What is true of the shops is also true of the erection division. There is a scarcity of learners and few apprentices. The union allowance of one to each ten men is not reached. Figures taken from the industrial census of 1910, as noted in another chapter, show but 2,373 of apprentice age out of a total of 41,441 employed, and survey visits indicate that as many as half of these younger workers are engaged in simple laboring jobs. On 57 jobs visited, where a total of 505 men were employed, there were but 13 apprentices and only 15 others that might be called helpers, exclusive of the number found who devoted their time to carrying material around the job. With the exception of work on suburban frame houses and on the better class of jobbing there is little chance for learners to get an all-round trade training.

The conditions of employment in outside work are such that it is easy to see why so few young workers are attracted. Cleaning and carrying take up most of the workers' time, and there is little opportunity for tool practice. In common with the other branches of the building trades there are few tool chasing and

holding jobs, and a sturdy constitution is needed. For this reason it is seldom found advisable to hire workers under 18 years of age.

The small number of helpers in job and erection work is also due to specialized operations. Men whose duties in the building trade represent little other than common laborers' work are grouped in different divisions or squads, each of which represents a special stage of work. For example, it is not uncommon to find men who, after working on the cutting and nailing of sheathing or for a few months on rough floors, have obtained employment making concrete forms and then have passed to framing and the simpler floor laying. Cases were noted where this advancement was made within a period of a few months.

NATIONALITY AND AGES OF WORKERS

Nationality: In the shops visited it was noted that of the 14 shop superintendents, 11 were trained in New York, two in Europe and one in America, outside of New York. Of the supervisory staff, that is, shop detailers, machine and bench foremen, of which there were 59, that 20 received their foundation training in Europe and 39 in New York. Of the 173 workers engaged as machine and bench helpers, or apprentices, in the shops visited, 21 were foreign, or foreign-trained workers. Of the 89 that could be classified as American born, few were of the type that would serve an apprenticeship. This force of helpers and apprentices is recruited from a class of boys or young men who are not inclined toward steady employment. It is a matter of record that in the shops visited about the full number are hired each year to maintain this group of helpers, showing that the average term of employment has been little more than one year.

There are many reasons for this shifting of employment, chief among them being the small wage paid and the uncertainty of employment, causing these young men to constantly seek a change of position at a higher salary. Another reason is that such young men are kept on work that offers little hope for advancement. The surroundings in many shops are far from encouraging to the younger workers.

Of the 845 workers on machines and on bench tools, there were, in the shops visited, 223 machine and 88 bench workers trained in this country, and for the most part in this city, whereas there were 99 machine and 435 bench operators trained

abroad. This gives 83% of the bench hands as foreign born and 30% of the machine operators.

Ages: The ages as given in the census of 1910 show as follows:

Group Selected—	No.	10-13	14-15	16-20	21-44	45 plus
1. Semi-skilled machine operators	837	2	22	121	453	209
2. Cabinetmakers and helpers	3,629	0	2	127	1,988	1,512
3. Sawyers	739	0	2	56	459	225
4. Carpenters and helpers....	41,441	0	3	2,370	27,006	12,063

Questionnaires prepared for the purpose of the survey were arranged so as to tabulate workers from 14 to 15; those 16 to 18 and those over 18 who had been engaged during the year, as well as the minimum age of untrained beginners and the special age requirement set by any shop. Figures obtained show that of the 35 shops visited none hired boys less than 16 years of age. This was due, no doubt, to the laws concerning machine operation. For this reason it is hard to account for the figures given in groups (1) and (2) of the census figures.

In these same shops none were found engaged as machine operators between the ages of 16 and 18, unless we consider the 18 shop and bench hand apprentices who were allowed at times to work on the adjacent machine tools. Bearing in mind the objections heard to the employment of young workers as machine operators, it seems safe to assume, therefore, that the 56 listed as sawyers in group (3) would be mostly of the ages between 18 and 20. No helpers or apprentice carpenters younger than 18 were found.

An effort was made to determine the minimum age accepted for employment in each division. The statement given by the majority of employers was 16 as a beginning age. But few workers of this age, however, were found, and they were in shops where the work consisted of simple tool operations.

REGULARITY AND CONDITIONS OF EMPLOYMENT

1. *Seasonal Fluctuations:* Building construction is a seasonal occupation governed not only by the weather conditions but also by the seasonal demands of moving and renting. The daily weather condition also governs employment to a large extent in those divisions of carpentry and joinery whose per-

formance is carried out in the open. Even in partially finished structures extreme cold necessitates the lay-off of men because of the limited return from labor performed.

Not only is there fluctuation from month to month, but there is a pronounced fluctuation from year to year. In Greater New York in 1912, \$201,098,006 was spent for new buildings and \$16,944,872 for alterations and repairs, while in 1914 there was \$135,427,881 and \$15,167,660, respectively, spent for such work.

These figures are for all branches of the building trades, but the fluctuation of 33% may be assumed as applying with fair accuracy to the variation in the wood-working trade.

The following tables, based on a report made by the New York State Department of Labor, give the per cent. of idleness in the building trades for a number of years. The report for the year 1913 presents a fairly accurate picture of the fluctuation in these trades. The figures for the years 1914, 1915 and 1916 show the influence of the war on the per cent. of idleness in these trades:

CHART 1

BUILDING AND PAVING TRADES—IDLENESS

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1913	..27.9	27.7	27.1	19.2	17.4	21.1	21.7	20.4	19.5	23.5	28.0	40.4
1914	..46.2	48.9	44.1	39.4	32.0	34.7	29.3	31.8	35.1	34.4	43.2	47.3
1915	..50.9	51.3	45.2	40.5	35.4	38.0	34.9	33.4	29.3	23.7	23.3	30.4
1916	..34.6	35.5	37.6	27.8	28.0	29.2	...	...	...	...	...	...

The percentage of idleness (Chart 2) in wood-working mills and furniture factories, as shown below, is on the average considerably below that in the building trades.

CHART 2

WOOD WORKING AND FURNITURE—IDLENESS

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1913	..26.8	28.9	26.2	23.5	18.6	16.1	14.4	18.0	18.8	20.1	23.9	24.7
1914	..35.2	41.3	41.4	32.5	28.8	25.9	31.2	31.7	31.9	27.5	29.5	31.7
1915	..36.1	38.1	38.2	29.0	24.4	23.2	25.4	23.7	16.4	14.1	13.8	13.0
1916	..15.4	18.4	17.7	12.8	20.5	25.6	...	...	...	...	...	...

2. Rush Jobs: In order that buildings may be erected in a short space of time, so as to make them available for renting or sale at their best season as well as save the expense of ground rent and interest charges, every endeavor is made to hasten completion.

It is not unusual to find large groups of men employed but for a few weeks in order to expedite construction. For example, after the plaster is dry enough men are employed to cut and fit the wood parts of a ninety-room apartment house in about two weeks. These men are laid off when not needed, and, as a rule, lose time in having to look for employment elsewhere.

3. *Specialization*: The list of divisions given below shows the great amount of specialization that prevails in the trade in New York City. There are numerous other divisions, but they are hardly of enough importance to be considered in detail. Among these are the weather-strip worker, the screen-door and window-screen fitter, the store-front erector, the hardware fitter, etc. This extreme specialization causes an unfortunate condition of employment. Although there are many men yet to be found who have an all-round training in carpentry and joinery and who engage in more than one of the divisions noted, the demand of today is for the specialist. On account of this demand it is found that carpentry and joinery is practised by many who have either never learned more than one division of the trade or who have worked in the same division for years. The liability to lack of steady employment due to this specialization is evident.

4. *Lack of Materials*: New York City, on account of the higher wages, land values and hauling charges, is unable to compete with the smaller cities more favorably located as to raw materials, lessened land values and a cheaper labor source. For this reason it is rapidly becoming an erection rather than a wood trim manufacturing center. But a few years ago each builder had a shop of his own where his men, during dull seasons, prepared the materials for future erection. Employers now need only to maintain an office and have their trim detail made and shipped in from out of town. Often delays in shipping compel employers to lay off men.

SCALE OF WAGES

The following is the union scale of wages for an eight-hour day:

	Outside	Inside (Shop)
Manhattan Borough.....	\$5.50	\$4.50
Brooklyn Borough.....	5.00	4.50
Bronx Borough.....	5.00	4.50
Queens Borough.....	5.00	4.50
Richmond Borough.....	4.50	4.50

Stair builders are paid the same rate for inside and outside work. The men work forty-eight hours a week. Saturday afternoon work is allowed only in case of emergency and after a permit has been obtained. For such service, if allowed, the pay must be doubled for each hour. This is true for all overtime, Sunday and legal holiday work.

When carpenters are sent to another borough, or to another city, the wages of the city or borough from which they are sent must be paid, but the employers may, if they choose, employ workmen in these boroughs to do the work.

Mills that manufacture solely for the trade and do not themselves contract for erection have a trade agreement with the United Brotherhood of Carpenters and Joiners that fixes \$18.00 as the minimum wage for a week of forty-four hours for mill workers.

In the following table is shown the range of wages paid in the shops and on the jobs visited:

	Per Week	
Shop superintendent.....	\$36.00	to \$50.00
Outside man.....	22.00	to 40.00
Shop detailer.....	15.00	to 27.00
Foreman—bench	27.50	to 38.00
Foreman—machine	20.00	to 35.00
Shop helper.....	6.00	to 22.00
Sander	7.00	to 15.00
Glue hand.....	11.00	to 18.00
Machine operator.....	10.00	to 24.75
Bench hand.....	9.00	to 24.75
Superintendent on job.....	36.00	to 60.00
Foreman on job.....	24.74	to 33.00
Journeyman joiner	16.50	to 27.50
Journeyman stair builder.....	24.00	to 27.50
Journeyman metal trimmer.....		27.50
Journeyman framer	20.50	to 27.50
Journeyman floor layer.....	16.50	to 28.10
Journeyman fixture assembler.....	22.00	to 27.50
Journeyman concrete form worker...		27.50
Concrete strippers.....	15.00	to 18.00

Under "joiner" are included many of the specialists erecting trim and details.

The above shows the maximum and minimum wage noted on survey visits. Many answers were accepted with some doubt, and the result of the survey visits seem to indicate that there is a disregard of the union scale on work other than that on

completely unionized jobs. Only when the workers of the allied building trades or the Master Builders' Association control a job is a complete adoption of the union scale assured.

The wage scale in some of the larger mills and cabinet shops is considerably less than the union scale. As these mills are classified as "unfair," their product is not handled in erection by union men. Much of this material is supplied to non-union jobs where a smaller wage is paid.

The eight-hour day is commonly adopted, although some shops resort to a nine and ten-hour day during seasons of unusual activity. For this extra service a pro rata amount is paid. There were a few jobs noted where the nine or ten-hour day was the standard, but during the winter months this is reduced with a consequent reduction in wages.

ORGANIZATIONS

Employers' Organizations: The Master Carpenters' Association is affiliated with the Building Trades Employers' Association, and comprises employers in all branches of the wood-working division of the building trades.

The object of the association is "To foster trade, protect the members from unjust and unlawful exactions, diffuse accurate and reliable information among its members, as well as provide harmony and justice between employer and employee."

There are 15 manufacturing wood-working mills affiliated with this association, and of the 91 listed contractors who are members there are but 32 who maintain wood-working shops. Of the 91 employers there are 41 who are classified as general contractors. There are 964 independent contractors who have signed the agreement with the union to observe conditions specified by them, but there are a great many employing about one-half of the workers of the industry, who are subject to no jurisdiction.

Employees' Organizations: The wood workers have an organization called the United Brotherhood of Carpenters and Joiners. Affiliated with this is the Amalgamated Society of Woodworkers, an organization to which a larger rate of dues is paid, with consequent added benefits. In New York City these organizations are closely allied, and the making of agreements and the supervision of conditions of labor is left largely to the United Brotherhood. The objects of the United Brotherhood, as given in their constitution, are: (1) To discourage piecework;

(2) To encourage an apprenticeship training and a higher standard of skill; (3) To cultivate feelings of friendship among the craft; (4) To assist each other to secure employment; (5) To reduce the hours of daily labor; (6) To secure adequate pay for the work; (7) To furnish aid in cases of death or permanent disability; (8) To elevate, by legal and proper means, the moral, intellectual and social condition of the members; (9) To improve the trade.

The jurisdiction of the United Brotherhood of Carpenters and Joiners extends over the work enumerated below in so far as it is organized. "Milling, manufacturing, fashioning, joining, assembling, erecting, fastening or dismantling of all materials of wood, hollow metal or fibre, or of material composed in part of wood, and the erecting and dismantling of machinery, where the skill, knowledge and training of a carpenter is required, either through the operator of a machine or hand tools." The claim of jurisdiction extends over the following trades: Carpenters on house, ship, dock, wharf, bridge and railroad work; joinery on house, boat and car work. Under the latter division are included stair builders, trim joiners, cabinet makers, floor layers, bench hands, boxmakers, car builders, furniture workers, reed and rattan weavers, millwrights and operators of wood-working machinery.

There are numerous divisions as to membership, each governed with relation to age, dues and occupation. In general, a candidate is not admitted to full beneficial membership under 21 years or over 50 years of age, although provision is made for the admission of apprentices between the ages of 17 and 22 years, and for men over 50 years of age.

Where there is no record of an apprenticeship having been served, or sponsors are not forthcoming, it is often necessary to examine candidates for admission, in which case they are given simple oral examinations, or possibly tool tests on bench joinery dealing with the specialized division in which they claim proficiency.

An employer having two or more journeymen is allowed to have one apprentice, but this number may be added to by one for each ten men, the apprentices to be distributed between jobs. While there is provision made for the establishment of an apprentice wage scale, there seems to be no definite effort to enforce such a scale.

Members may engage in contracting, provided they observe the conditions imposed on other union wood-working employers, it being required that such contractors do not engage in piece-work, lump work or sub-contracting for another contracting carpenter, and provided that they do not affiliate with any employers' association.

The United Brotherhood deals through delegates and officers with employers in establishing trade rules concerning hours of work and compensation, providing a job label and assigning a shop representative to the supervision of the conditions of work and the applying of the union label. A list of so-called "fair jobs" is made by the Brotherhood and distributed for the information of members. The United Brotherhood of Carpenters and Joiners is affiliated with the other building trades in a council whose function is to enforce better union conditions on jobs representing highly specialized trade divisions.

There are 17,000 registered union members in the city of New York. Of this number about 5,500 are engaged in mill and shop work.

METHODS OF CONTRACTING

Contractors for carpentry building work may be classified under four headings, *i. e.*, the general contractor, the percentage contractor, the sub-contractor and the lumpers.

There are contractors who take complete charge of the designing as well as the construction of buildings, these being called contracting designers. Rarely does a wood worker take contracts in this way, an exception being the suburban joiner with architectural ability who occasionally obtains contracts for minor jobs by doing also the architectural work. A wood-working contractor generally works under a contracting designer in about the same manner as he works under a general contractor, with the exception that the contracting designer may furnish supervision to the contracting wood worker.

The General Contractor takes complete charge of a job and when so equipped may furnish the shop and the finished material entering into completed structure. He figures jobs from the architectural details and specifications. Where his equipment does not allow him to do this he obtains estimates from sub-contractors, material men or lumpers for the various divisions of the work. To the sum of these estimates he adds his cost

of doing business, plus a margin for profit, arriving at a "bid" which he submits for the work.

Often he gives much of the work to sub-contractors who are able to more economically conduct the work. He must have financial resources, dependent on the size of the job, and governed largely by the methods and time for payment on completed work.

The Percentage Contractor, a newer type, represents an effort to devise an equitable method of contracting, which has as its object the construction of a building at a cost dependent upon real construction value, plus an added per cent. commensurate with the cost and need of supervision in construction. Provision is made whereby the owner profits by all savings in time, and construction and provisions are also made whereby the percentage contractor is encouraged and rewarded for making any savings. The percentage contractor does not have the financial responsibility of the general contractor because he is enabled by the methods of payment to handle jobs through financial co-operation with the owner.

The Sub-contractor works under the direction of the contractor, as noted above, the architect or owner. He receives blue-prints and specifications from which he estimates quantities of materials and costs of doing work. He may send these drawings to mills and material men or to some sub-contractor who may be called upon to submit bids covering their narrower division. As is true of the general contractor, he must add to this cost of doing business and supervising the work. His financial dependence is correspondingly less and has to do largely with payment agreements he may make with the general contractor. As a rule he must maintain a shop and handle materials. The cost of maintaining this shop during slack season must be considered in the making of the contracts.

The Lumper: A type of contractor called a "lumper" is commonly met with in the construction of modern buildings of the speculative kind. When the large amount of speculative work being done in New York is considered, the important place of this type of contractor may be realized.

The lumper simply estimates the time and cost required to erect material furnished by owners, general contractors, sub-contractors or speculators. He has no interest in cost other than that of time, his problem consisting in the erection of material as quickly as possible. His work must be erected neatly and

economically, any waste of material being checked by the contractor or owner interested in the supplying of this material. His financial dependence varies with the number of men employed, but provision for payments is usually made by his employer in reference to this number. "Lumping" is, in a sense, piecework on a larger scale, and an effort is made by labor organizations to prevent their members from participating in this kind of work.

The contractors for wood working are not conditioned by legal restrictions as are those in the electrical, plumbing and steamfitting trades, and individuals without any large amount of previous training or capital, and possessing only knowledge sufficient to estimate quantities or compile estimates and negotiate the purchasing of materials economically, may enter into contracting.

In contrast with certain other trades, such as the printing trade, only a small number of the contractors in the carpentry trade are members of trade associations dealing with their employees through trade agreements and representing advanced standards of work. To the great number of unaffiliated untrained building contractors in New York City employing shifting labor groups of specialists may be laid much of the demoralizing labor condition that exists.

A small proportion of the contractors or sub-contractors possess their own mills or cabinet shops, but a large amount of the trim, sash, blinds and doors used comes from mills outside the city.

The work in the mills as well as the work performed upon the job has reached an extreme degree of sub-division of labor, and the industry as a whole, except in the small jobbing shops, is employing specialists rather than all-around workmen.

ANALYSIS OF THE TRADE

An analysis of the trade of carpentry and joinery, as practiced in the City of New York, shows that the trade is divided into two quite distinct classes—mill and shop work, and erecting work. In the endeavor to classify, one is confronted with instances of overlapping and variations, and is, therefore, compelled to classify in general terms. If the words "inside" and "outside" were chosen to represent these two classes, the terms would have to be defined as meaning work done inside a mill

or shop, and the work done outside the mill or shop, although in the latter case most of the work would be done inside of the building being erected. Again, considerable of the work done under the heading of "erecting" is alteration and repair work.

For the purposes of this survey this classification of "mill and shop work" and "erecting work" will be used. Mill and shop work will be first considered.

MILL AND SHOP WORK

By a mill is understood a plant turning out details of building construction such as doors, window frames, sash, trim, etc., in large quantities to be sold for builders' use. There are comparatively few such establishments in this city. Great quantities of such building materials are brought into the city from distant mills. But there are numerous shops, some of considerable proportions, where such details are turned out by the builders themselves for use upon their own contracts and to sell to other contractors. Small shops make use of the same kind of machines as are employed in the large mills, but whereas in the large mill the worker is often constantly employed in the operation of one machine, in the small shop he commonly spends but part of his time on any particular machine and the rest of his time on other work.

In surveying the organization of a shop and analyzing its units it was found that there is no type or standard. The size of the shop and the kind of work done modifies its organization and methods of operation. The operations required for the finishing of the various parts are numerous and varied and call into requisition various machines and workers. As there is no standard practice as to specialization, each type unit of operation will be considered by itself.

In an analysis of the shop work the workers may be viewed in two groups—one composed of machine operators and the second of all other shop workers. This latter group will first be considered, beginning with the duties of the man in charge of the shop. It should be understood that no two shops follow exactly the same procedure in regard to the specific duties of individuals.

The Mill Superintendent supervises the various departments of the mill and oversees the distribution of the work.

The cost of production and its relation to contract price is

the first of the shop problems of which the superintendent must be master, and, if necessary, he must be able to suggest improved methods to increase the job profit. Responsibility for the upkeep of the plant devolves upon the superintendent. He advises as to the use and efficient placing of machines, as well as in regard to the introduction of newer machines or newer methods.

The scope of the superintendent's equipment should include ability to read blueprints and specifications, to make working drawings and sketches, and to estimate costs and knowledge of the various qualities. He should be familiar with all types of construction in wood and have a thorough knowledge of details and methods of manufacture by machine and bench processes and of the time required on each job. Moreover, he should understand the principles of efficient shop management and be competent as an executive. There are at present about 84 wood-working shops in this city of such size as to employ a superintendent. Although a position of importance, the number of positions has decreased because of the loss to New York of much of the mill-work industry. On the other hand, it is clear that there will always be a demand for men of experience and ability to fill these positions. It is evident that such men possess the breadth of experience which fits them to become employers or contractors when possessing the necessary capital.

Outside Man: After a study of the details of the architect's plan, the outside man goes on the unfinished job to obtain exact sizes for trim, fixtures, etc., and in this work he may have to suggest or devise constructions for some details not shown by the architect.

He makes simple sketches, noting all the sizes, as well as sizes of the details which the work must fit. He notes also the kinds and qualities of the woods to be used, the finish desired, and whether materials and finishes selected are in agreement with the specifications and estimate. He takes the sketches and information to the office, where he revises them, if necessary, to meet the needs of economy or to improve the construction. This information is checked by the shop superintendent or the foreman. The sketches and description are turned over to the shop draftsman who prepares drawings when needed. An outside man is employed by all mills making building details. The larger mills employ as many as four or more men. Outside men are usually employed by the year even if it is necessary that they be used in the drafting or shop divisions during

slack season. If they have trade and shop experience, they may advance to the position of superintendent. Outside men in New York City are needed to obtain dimensions for all mills doing business for this city. The number, therefore, will increase with the volume of construction.

The Shop Detailer receives the architect's details, or often only simple sketches made by the job man or "*outside*" man. He studies the details and specifications and from them makes shop drawings, showing the details of construction.

The general practice followed is for the shop detailer to make full-size section drawings, with smaller drawings of elevations to $\frac{3}{4}$ -inch, $1\frac{1}{2}$ -inch, or other scale, which are easy to read with the $\frac{1}{8}$ -inch division rule common to the bench hand. These drawings show all detail dimensions, together with any special information that may be needed.

The very nature of his work and its importance to the shop requires that the detailer possess a wide technical knowledge. He should first of all possess facility in making all kinds of detail drawings of wood construction and be able to interpret drawings, sketches, specifications and verbal directions in terms of practical and economic methods of work. He should have a knowledge of shop and trade terms, know stock sizes of materials and how to best utilize them, and be familiar with the various kinds of wood, their properties, uses, qualities and costs. He should be acquainted with architectural styles in regard to details and proportions, have some knowledge of the principles of strength of materials and a thorough familiarity with the uses and the fitting of hardware. There are about 350 men in the 621 shops in Greater New York devoting most of their time to this work. This work is very important, especially in shops doing a high class of work. The training these men receive makes them of value in architectural work. These men are, as a rule, employed by the year, especially where they possess shop experience enabling them to do tool work during the slack season. They are often required to do the work of the outside man and are in direct line for promotion. On routine and the cheaper class of mill work a semi-skilled grade of detailer is employed and at a low rate of wage. These workers have little opportunity for advancement. The competent shop detailer must obtain the greater part of his knowledge of computation and drafting through outside agencies.

BENCH HANDS AND SPECIAL WORKERS

Foreman of Bench Hands: In shops employing a superintendent there is usually a foreman for the bench work and a foreman for the machine work.

The foreman of bench hands receives working drawings from the shop detailer, or from the superintendent, these drawings having been made full size where necessary. He prepares a stock list from these which is sent to the machine foreman to get out the stock. The foreman's duties beyond this are confined to the interpretation of the drawings for the men, making sketches and giving verbal information about the construction. Where time permits he assists in bench work.

The bench-hand foreman should be able to make and read working drawings and should thoroughly understand wood construction. He should be familiar with the proper methods of assembly as well as the costs and characteristics of different woods, and should understand special processes, such as the arranging of jigs and templets. He should understand the possibilities of machine work, though not necessarily an expert in the use of machine tools, in order to suggest machine operations where possible instead of the slower hand processes.

In shops specializing in producing store, office, loft and other fixtures, the foreman receives a plan and elevations of the room in which the work is to be placed. He makes sketches and estimates, and, after they have been accepted, a full size layout, if the construction is difficult, or a complete scale drawing in the case of simpler construction.

From these drawings the foreman makes multiple stock lists, giving the number of pieces, the length, width and thickness, with the kind of material to be used. The list is made so that each piece is check marked, and any special construction is shown in detail. The list is sent to the machine wood-working division where the materials are prepared.

Ability to make working drawings as well as knowledge of the kinds, qualities and costs of materials, *i. e.*, wood, glue, hardware, glass, etc., should be acquired by the competent foreman. He should know stock sizes, and his knowledge of wood should be so thorough as to enable him to plan his construction to overcome the tendencies of seasoning and drying, as well as to insure the use of the most economical and serviceable materials. In order that he may be able to plan his work satisfactorily he

should understand building construction in a general way and possess a thorough knowledge of the special construction of store and office fixtures. The State industrial report of 1913 shows there were 621 shops devoted to house trim and cabinet work. In many of these shops a great many foremen are required. On these men depend much of the success of the shop, and they are in line for advancement to the positions of superintendent and employer. They are invariably employed the year around, being used in the smaller shops on journeymen work during slack season. The competent shop foreman is qualified to supervise both machine and bench work. As the organization of large mills has developed specialization and the building of stock details in quantity, the services of the all-around foreman have decreased in importance. There are, however, many mills producing a high-class work in which there is still need of the broadly-trained foreman. Outside agencies may be of service in furnishing such a man instruction in detail drawing and cost estimating.

The Dry Kiln Attendant: It was found that in the majority of the shops visited, the work of caring for the kiln drying of lumber was left to the foreman of either machine or bench work. The charging and emptying of the kiln is usually done by laborers at his direction. The attendant selects the kinds and sizes of materials from stock lists, noting whether they are properly air seasoned, suggests and supervises the method of stacking and notes whether heating and other devices are working so that the wood will be thoroughly seasoned. He fixes the time of the heat and supervises the emptying of the kiln.

The attendant's knowledge, other than that obtained as a wood worker, should cover the use and care of the different types of kilns, methods of stacking material, terms used and their meaning in kiln drying, *i. e.*, case hardening, honeycombing, checking, etc. He should have a general knowledge of the principles of ventilation and ability to read the thermometer and hydrometer in determining seasoning conditions. He should be able to read stock lists and to keep records of time required to obtain efficient seasoning results. The attendant should understand board measure and have a knowledge of the peculiarities of the different kinds of wood and the care needed before, during, and after seasoning in each case. The number employed is hard to estimate, as a dry kiln attendant is needed only in the larger shops.

The Shop Laborer and Machine Helper obtains stock called for by the foreman and places it in the dry kiln, stacking it at the foreman's direction so that it will dry efficiently. When directed to do so, he carries this stock to the machine operators, following the routine of the shop in the distribution of the work. The worker must note that the pieces called for on the list are obtained and that each is properly check marked before delivery to the next worker. When the stock has been completely machined he gathers the pieces for each job and delivers them, with attached stock lists, to the bench hands.

In the majority of the shops he works also as a machine helper, standing back of the woodworking machine to receive pieces and pass them back for a re-cut. Among his other duties are those of caring for the glue pots, cleaning the shop, or if skillful, the sanding of stock.

In the union shops, he is not allowed to handle tools of a cutting, fastening, or layout nature. Where proficient the laborer is used on gluing operations generally as assistant to a bench hand.

The Glue Hand prepares the glue and applies it in the assembly of wood parts. This assembly is mostly confined to the building up of material, veneering surfaces and the assembly of pieces that have to be remachined, *i. e.*, counter tops, panels, pieced cores, etc. Rarely does he assemble the completely machined projects; this work, unless in a specialty shop, being assigned to the bench hands. The glue hand receives the stock from the machine hand, placing it in a heating receptacle, then arranging trestles, or other supports, he makes ready by thinning the glue to the consistency needed for the job. Taking the stock from the heater, he arranges it so as to receive the glue efficiently. He clamps the pieces, making note of their alignment, and sets them to harden. After the pieces have set he removes the clamps and sends the pieces to the machine hand for re-machining.

One or more glue hands are needed in each shop. These positions are important enough to assign high-grade men in shops devoted to first-class work but in the majority of cases a lower grade mechanic is employed.

The Sander smooths straight or moulded wood surfaces. He chooses the grade of sandpaper, holding it on a block for flat surfaces, or in the hand for moulded surfaces. His work may consist entirely of hand sandpapering, entirely of machine sand-

papering or of both. The machines for this work are of various types, some having a continuous belt of sandpaper, and other disks or cylinders covered with sandpaper. There are also machines with moulded blocks, fitted with sandpaper, that oscilate to and fro. Rarely does the sander adjust these machines or apply new sandpaper to them, this work as a rule being done by a skilled workman or the foreman.

The sander should know the various kinds and grades of sandpaper and should have a general knowledge of wood structure to understand the best methods of sanding various kinds. He should also know how to make and use the simple forms needed to hold the sandpaper in smoothing straight and curved surfaces by hand. There are often three or more of these workers even in the smaller shops. Their work is relatively unimportant but on the sanding of high-grade work a sander with bench experience is used. Such men generally work in other divisions and the necessary skill and knowledge is gained in the shop.

The Bench Hand Cabinet Maker: The bench hand receives the pieces the machine hands have prepared, together with the mill list with its sizes and check marks. He is given also the detailed drawings needed for assembling the pieces. This detailing, in most shops, includes a full size layout on heavy paper, with lengths, width and thickness shown in section drawings. Elevations drawn to scale are included where needed.

The bench hand may check his work by laying it on the drawing. Arranging his stock so that it is accessible, and adjusting clamps or other holding devices to distances needed, he makes ready for assembly. He obtains glue, or other materials, and places his tools within easy access. When a job is complex a trial assembly is made so as to insure rapid work after the glue has been applied. If dowels are used, he glues and inserts them, care being taken that each is properly coated. Glue is applied to the joints, care being taken that it does not run on to panels or exposed surfaces from which it will be hard to remove during cleaning. The bench hand must also note that panels are given opportunity to adjust themselves to the tendencies to shrinkage and swelling. When the complete project is glued, assembled and clamped he allows it to stand until the glue sets. During this interval he may work on other parts of the same general job or on a different assembly.

The bench hand uses automatic clamping devices for regular

work, nailing the joints to hold them until the glue sets, after which he planes, scrapes and cleans surfaces or intersections. On work not requiring special care a sander may be used to sand-paper the surfaces. A great deal of the cleaning is done on machine sanders, hand work being needed for mouldings and joined parts only.

The assembly of complex pieces may necessitate the re-cut of some of the members, because of the difficulty in arriving at true lengths and forms. Mouldings, especially those that are raised above the surface, are applied after the machine cleaning. This work is done by the use of mitre boxes, or bench trimmers. Base or cap mouldings, pilasters and other forms are cut and fitted by hand, as it is seldom possible to cut them by machine economically to an accurate fit.

After all tool work, such as the trimming of intersections and scraping out of corners is done, the work is given a final sanding and is ready for the wood finisher. After assembly and cleaning is finished, hardware is fitted, but may not be applied until the pieces have been stained and varnished.

In the course of assembly the bench hand has often to use the simpler machine tools, such as the saw and joiner, particularly in a shop where the workmen do not specialize to a great degree, or where problems are not of a uniform nature. In using these machines he has often to devise jigs for the sake of greater speed and accuracy. Common among these are guide pieces, needed to cut duplicate lengths and angles. Devices for wedging and holding are repeatedly made use of during assembly and the workman should be able to devise the simpler of these.

Where no glue hand is employed the bench hand occasionally does the work of veneering. There are still many shops in this city manufacturing detail for high-class work that require the services of the all around bench hand in the construction of details of the better sort. These shops are enabled by the nature of their work to pay the union compensation and offer fairly steady employment.

The all around bench hand, however, has been replaced to a large extent on quantity production by the bench hand specialist. Judging by the survey visits, the all-around man, when found, is generally the product of foreign trade training. Rarely were high-class workers found who were trained in this country. The specialist bench hand, of which there are large numbers, is easily trained in the shops in the course of regular work. There is no

absolute standard and the quality of work in each mill and shop is characteristic of the class of construction to which it caters. Much of the work of the bench hand has been eliminated by machines, as well as by introduction of metal fixtures, although workers with the experience of the bench hand, are employed upon the latter. The specialist bench hand, except in the unionized shop, is not as well paid as the all around worker and is less sure of steady employment.

The great decrease in the number of apprentices and the falling off in immigration from northern Europe during recent years have both operated to decrease the supply of skilled men. Although all around men are preferred, employers make little effort to train them. The bench hand must change about from shop to shop in order to gain breadth of experience, but on account of the limited opportunity afforded by each shop, this process is not very effective. Outside agencies would be of assistance in affording instruction in bench work, technology of materials, machine operations, the reading of drawings and the laying out of simple details.

The Bench Hand Specialist: The bench hand, in shops large enough to permit of specialization, is assigned, often for days at a time, to any one of the following divisions: assembling heated stock and gluing to its surfaces a veneer as noted; assembly of stock; trimming tenons; cutting ends by hand where needed to fit the shape of mortise made by the chain mortisers; fitting coped edges to intersect with moulded adjacent edges; trial assembly and placing stock in heating box; gluing and operating glue press; fastening, squaring stock, aligning it and setting it to dry. After gluing, the bench hand works on any one of the following steps: smoothing surfaces; scraping marks from surfaces, or planing and scraping intersections; cutting and fitting mouldings; cutting joints by using a mitre box, a bench, foot, hand, or machine power trimmer; nailing and setting mouldings; sanding moulding intersections; assembling parts; putting together the details and gluing, nailing or otherwise fastening them.

The Bench Hand Wood Stair Builder receives from the shop foreman, or the machine hands, pieces to be assembled or made to suit marked detail. He either works on many of the machine tools himself or receives the machined stock from the machine hand. In the case of box newels, paneling, winders, wall strings, etc., he assembles and glues the machined stock which is set to

harden, after which it is further machined, if needed, before the bench work is completed. The bench hand assembles the work in the shop as far as the job will allow. In each shop there is generally at least one man able to mould hand rail wreaths, the pattern for the square of which has been derived by the foreman. Such a man fastens curved and straight rail sections together, bolting and gluing them as a rule and smoothing the joints to a true intersection. Due to Building Code restrictions as well as the great number of large buildings erected, the work of the wood stair builder is decreasing. There is a great deal of small house work done in the suburbs, the stairs of which are made in large quantities and which permits specialization and the employment of a lower grade and lower paid workman. Rarely are stairs of complex details requiring expert workmanship needed except for a comparatively few high-class private houses. There are but few stair building shops in the city capable of executing high-class work and they depend to a large extent on out of town orders for their support. There is no apparent shortage of men in this branch and any surplus of stair builders readily finds employment in other divisions of the trade. For the thorough knowledge now rarely needed in the layout of staircase and hand rail parts outside study of drawing and laying out is needed.

MACHINE OPERATORS

The second group in the shop to be considered is that of machine operators. The following enumeration is made merely for convenience of analysis. Only in the larger shops are workers assigned to the continuous operation of but one machine. A worker generally uses one or more machines as the requirements of the job he is on may demand.

There are many elements of knowledge and skill that are common to the handling of the different machines. In order to avoid needless repetition in incorporating these common factors in the description of each operator's requirements they are summarized here.

Each operator should understand the care and use of his machine as a whole and of each of its component parts and attachments, unless the shop provides for the care of the machine by some one besides the operator. Such care includes the sharpening of saws and cutters, and all cutter requirements.

He should know how to read working sketches and the stock lists from which he works and should be familiar with the various kinds of woods and their peculiarities, particularly as affecting their manipulation. He should know the best methods for arranging his stock for efficient handling, and how to pass stock through machines with grain in direction to produce best surface results, and should be able to lay out measurements to $1/16$ of an inch with facility.

The Foreman of Machine Hands: The duties of the machine foreman are many and have to do chiefly with getting out the stock, lists of which are given to him. He supervises the selection and preparation of the lumber in conformity with these lists. When, as is true in most shops, there is no dry kiln man he often supervises the operation of the kiln.

After the stock has been seasoned it becomes his duty to assign its working to the several machine operators, advising and checking them when needed. When the operator is unable to do so, he arranges devices which help in machine production and checks on waste allowances as well as the working efficiency of each machine and its operator. He checks the progress of the stock and routes it by laborers for each machine operation.

He receives partly assembled stock from the glue or bench hands and gives directions for its further machining, at times working on the machines himself.

As a rule the machine foreman sets machines for the unskilled and semi-skilled workers, instructing them in ways of starting, stopping and making adjustments. Where he does not assign others to do so he cares for the sharpening of the machine tools, their repair and upkeep.

The foreman machine hand should have a thorough knowledge of all the machines over which he has supervision. He should be able to use them efficiently and, if necessary, repair them. He should be familiar with shop methods, efficient shop routing, details of construction, and the qualities of stock. He should understand the use of speed indicators, and other efficiency measuring devices. Finally, he should have a knowledge of various types of motive power and its transmission, and be able to make simple repairs and adjustments. Most shops employ a machine hand foreman, but as a rule, he is given little extra com-

pensation and where no superintendent is employed works under the direction of the bench hand foreman. He is usually employed the year round, being engaged during dull season on machine tending and repairs. In shops doing work of a uniform nature and those large enough to employ two or more such foremen the work calls for little knowledge other than required of the machine tenders. There is little chance for the machine hand foreman to advance unless he has bench experience. In specialty shops the required training can be gained through routine work, but where the work is varied the foreman has generally had experience in different shops.

The Stock Cutter receives the stock list from the foreman. On this there is given, usually in the following order, and in separate columns: 1—a Job No.; 2—Kind of wood; 3—Number of pieces; 4—Lengths; 5—Width; 6—Thickness; 7—Special Information in regard to use of piece; 8—Special information as regards accuracy of length; 9—General remarks. Under this last heading is shown a sketch, if needed, which illustrates the final form of the piece, or the use of that piece, in the assembly of the job.

From this list he proceeds to get out the material. As is noted the kind of wood and length is given first. This enables him to group his cutting operations in such a way that short stock is out last, eliminating much of the tendency to accumulate short pieces with the attendant waste. The stock cutter must make rapid mental calculations in estimating the most economical way of producing each size. This may mean that he not only estimates in length and width, but has constantly to estimate in thickness for resawing in order to economize on materials. By noting use of piece under heading No. 7, he may be able to select pieces for some special service. Much of the success of the final job depends on this selection. Examples of this are: the selection of core stock, with its grain arranged to prevent distortion, and the cutting of pieces so that the grain on the finished surface matches. Noting construction from columns 6 and 8, and making the allowance noted in column 7, the stock cutter places the pieces and cuts them to length. Almost all shops are provided with swing saws suited for this purpose, the saw frame being hung in such a way that it may be swung across quite wide boards of varied thickness. The saw frames are, as a rule, weighted to swing back out of the way. The table upon which the stock to

be cut is placed is provided with dimensions usually to $\frac{1}{4}$ -inch division, and with a stop gauge which the stock cutter sets when he wishes to cut similar lengths. In swinging the saw across the table, he must take care that the saw is not jammed by a too rapid advance, or by careless handling of stock on the bench. Unless the shop provides mechanical means of sharpening, or has a man who does this work, it is necessary that the stock cutter sharpen the saw frequently. Some of the smaller shops rough out the stock on a saw bench, so arranged that the work may be advanced against the saw. This worker is the most important in the machine division as the success of the final job depends on his knowledge in selecting materials. In cheaper work this knowledge is not as necessary but in all cases economical cutting out of stock is essential. As a stock cutter must be skilled in the individual shop usage, an effort is made to keep him steadily employed and he may be used on other machines during slack season. As newer woods, generally inferior in quality and more difficult of machining are introduced, the stock cutter must constantly extend his knowledge. Rarely does the stock cutter work on the moulder and shaper. In cases where he learns to set up and care for these machines, his chances of advancement are increased.

The Rip Saw Operator receives the pieces from the stock cutter, noting the sizes called for by the marks on the surface. He measures the width of the stock, and where needed, straightens an irregular edge by ripping, oftentimes without the use of the gauge or fence. He then sets the gauge to the required width, measuring this distance with a rule if the saw bench is not provided with a scale and passes the stock over the saw, keeping it tightly pressed against the gauge.

The Jointer and Planer Operator: Before planing it to thickness in a surfacing machine, some stock has to be made true on one surface. It is also necessary to true one edge on most pieces before they are cut to exact widths, or otherwise milled. It is the duty, therefore, of the jointer-operator to take such pieces after they have been ripped to rough widths, and both surface and joint them. He adjusts the forward table of the machine by means of a hand wheel, raising or lowering it to allow the planer knives to project above it to the required size of cut. He notes the direction of the grain and passes the face of the piece over

the knives, repeating this operation until the surface is perfectly smooth and out of wind. This trued surface he places against the gauge and makes the edge square with it by passing over the knives. Occasionally, he removes the planer knives to have them ground, this grinding invariably being done by machine. He must whet the knives and, where they have been removed, must reset them even with the rear bed.

The Surface Operator receives the pieces from the stock cutter, the jointer or the rip saw operator, on which he is to produce a smooth surface, or surfaces and a given thickness. The operator may work on a surfacing machine which planes only one surface, or one that planes both with the one operation. He first adjusts the amount of opening needed between the bed and the frame, doing this by means of a hand wheel attached to the frame. When feeding stock of uneven thickness, or on which a heavy cut is made, he must be alert to prevent stoppage, any tendency toward this being noted by the sound of the cylinder head slowing down. In case of stoppage, with the knives in the cut, he is put to a considerable loss of time needed to lower the bed and remove the stock. Occasionally he must adjust the feed rolls to suit the character of the stock he is surfacing, according to whether it be smooth, rough or of wet surface.

The Saw Bench Operator cuts pieces of stock previously sawed, dressed and jointed, which he brings to accurate lengths and widths for the finished construction, allowing enough extra width for smoothing the edge. He works on a saw bench which is so arranged that the saw may be made to protrude to varied distances above the bench top. Either a rip or cross-cut saw may be used as required. The worker receives a stock list as noted for other machine divisions. He sets the gauge to the width of stock called for, making allowance for any needed edge dressing, and passes the pieces over the saw table, keeping the smooth edge against the gauge. When it is necessary to square ends or cut them at an angle, he attaches a gauge which is arranged to slide. Where the table is adjustable he tilts it so that pieces may be rip-sawed to a bevelled edge. When special cuts are to be made he often has occasion to devise holding devices, jigs, etc., in order that he be able to produce the required results.

The Band Saw Operator cuts stock to curved outlines and

other irregular forms which he lays out from patterns, when they are not laid out by the foreman or workmen. Occasionally he makes straight cuts, using, if possible, a gauge or fence which he attaches to the saw table and which he regulates to obtain uniform widths.

In sawing he endeavors to obtain a smooth and true cut by guiding his stock with the back of the saw. Where work is to be cut with a bevel edge he tilts the table top, clamping it in place at the angle needed, checking this angle by an indexed segment under the table top, or by making the top and saw side conform to a given bevel, or to marked stock. Where stock of irregular form is to be sawed he must attach clamps, or some other holding device, so as to prevent disastrous rolling while cutting.

The Moulder-Sticker Operator works on a machine called a moulder and sticker which produces mouldings and forms not possible to produce by other means. The competent man prepares cutters, needed to make these forms. Section details, or samples of the required shapes, are sent to him either by the office or by the foreman, and he fashions them with the cutters which he has in stock, or with new cutters which he makes. Cutters are made so that the edge will hold well on the kind and amount of wood to be cut and backed so that the cut will be as smooth as possible. The cutter is tempered, ground and whetted. Cutters for stock sizes are often cut to milled forms and the operator need only sharpen them to the required bevel, backing them as noted above. The operator carefully balances his cutters on scales during the making. Balancing machines, allowing for proportional balancing, are sometimes available for producing cutters needed for very accurate work. After the cutters are formed and sharpened the operator fastens them by bolting to the cutter heads, or spindles, noting that they are properly aligned, bedded and fastened to guard against shifting, chattering or flying.

In operating the machine he arranges his stock and passes it through with the grain in such a direction as to produce best surface results, checking the piece run with the sample or detail, and making any necessary cutter or machine readjustment.

The Shaper Operator works on a machine called a shaper,

frazer or variety moulder, which moulds the edges and surfaces of straight and irregular stock.

The shaper hand receives a section detail, or a sample of the shape required, together with the stock upon which it is to be cut. He may have to prepare knives, if such are not in stock. In doing this he works as does the moulder operator in grinding, tempering and whetting the edges to the shapes required.

To make ready the shaper operator unbolts the spindle collars and inserts cutters in the grooves cut for them on these collars. He aligns the cutters by checking their projection and height from the table and bolts them tightly. The spindles are then raised to the height required for the cut. The operator regulates or adjusts the cutting guide, hold-down pieces, and safety guards to the thickness, width and shape of the material to be cut, and then turns on the power, usually by means of a tripper pedal. When the spindle has attained its full speed (5,000 to 6,000 revolutions a minute, noted by the sound of the revolving spindles), the operator feeds his work into the cut. In feeding work to the machine he may have occasion to rest it against a stop, or guide, letting the knives enter gradually, and at a tangent, until the full cut is obtained. He then slides the work against and along the collars to the required distance, which is often measured by an adjustable stop piece.

The Tenoning Machine Operator usually works from verbal directions, receiving stock milled to sizes. He may receive a stock list with a sketch in the margin which indicates the size of the tenon. The operator notes waste allowances, tenon thicknesses and form, and adjusts the headstocks, by means of screws provided, to make the required cut. The power is turned on and a piece of stock is run. This piece is measured, or checked, for size of tenon and distance of tenon from the side. Headstocks may need independent adjustment, or the operator may move both by means of a screw provided for centering. Stock is tried by cutting until the tenon is placed, after which a cut-off saw attachment is adjusted for making it to length.

The Operator on Special Machines: In many shops there are special machines such as hollow chisel mortisers, sash mortisers and relishers, reciprocating chisel mortisers, post borers, etc., the operation of which is comparatively simple. On this account

these machines may be operated by unskilled workers, the setting and adjusting being done by the shop foreman.

The Shop Millwright, Machine Repairman and Sharpener is called upon to install machines, shafting, belting, guards, blowers, machine parts and accessories as well as make repairs. When possible he cares for the sharpening of the machines other than the moulder and shaper. In installing machines he may have to prepare concrete or other beds, set and align the machine and its accessories by leveling and squaring. He may be called upon to advise on the selection of machines, estimating the sizes and kinds of belts, pulleys, lengths and sizes of shafting, kinds and sizes of hangers, bearings, shifting devices, etc. It may be necessary that he devise as well as install safety guards. In sharpening he may have recourse to machines for this purpose. Occasional repairs call for the brazing of band saws, the re-babbitting of bearings, the reblocking and tensioning of buckled saws, the boring, tapping and patching of machine castings, etc.

Significance of the Occupation: There is at least one man in each shop to whom this work is delegated. In mills it is possible to divide this work into mill-wrighting and machine sharpening and repairs. The worker is usually drawn from the ranks of machine operators and can efficiently engage in that division if needed. The heavy work due to installation requires a strong physique. These workers are not only needed in all shops devoted to wood working, whether highly specialized or not, but are in demand for millwright work in all shops where power-driven machines are used. Although experience as a wood worker would give knowledge in regard to machine installation, this information can be improved upon by the study of the principles of power transmission and power requirements and sizes of pulleys, and formulæ for obtaining the lengths of belts and sizes of pulleys.

Significance of the Machine Division, Other Than the Stock Cutter: The machine wood workers are not well organized and their wages show a great variation, as noted elsewhere.

The ease with which men may be trained to set up and operate the saws, planers and boring machines does much to keep these workers in the ranks of the poorer paid. The operator of the shaper, the molder and tenoner who can also care for these ma-

chines receives the maximum wage the shop affords and is retained longest. In the smaller shops this work is usually done by the foreman. In mills supplying trim to be erected on union jobs the union scale is paid. The machine wood worker suffers from the effect of slack season although not to the extent as is the case with the outside worker. Newer high speed moulding machines with self-feed attachments tend to save hand labor. The New York machine wood worker is suffering severely from competition with the out of town mill with its cheaper material and labor supply. Although bench hands become expert machine wood workers, rarely does a machine hand become a bench hand. It is necessary that machine hands be physically strong and alert with good sight and hearing in order to detect dangerous and inaccurate adjustments. The loss of fingers or even sight of an eye does not necessarily incapacitate the worker. The non-specialized shop affords good trade training to the operator who seeks experience on each machine. Many of the workers in this division are obtained from the highly specialized and lower paid piano, furniture, etc., shops.

ERECTION WORK

It has been noted that in the shops the cabinet maker has largely become a mere assembler of machined parts; so on the outside job the carpenter and joiner has become more or less an assembler and erector of details more or less completed in the shop. All trim, stairs, doors, sash and window frames, are turned out at the shop assembled and complete as far as possible so as to require a minimum of fitting on the job. These facts have an important bearing upon the status of the trade in New York City, inasmuch as they permit the employment of relatively unskilled workers in the erection of thousands of dwellings by speculative builders of the cheaper class. In these cases the contractor may have but the slightest technical knowledge of building. He must know, however, how to buy his materials in the cheapest market and to hire more or less unskilled workers to erect his building. These workers are under constant pressure as to speed of work. A very large amount of this kind of work is done in New York and those so engaged, whether employer or employees, are generally not associated with trade organizations. Much of the wood material used comes from outside of the city. The products of the union shops and mills of the city on the other hand are used on the better class of buildings.

Under the classification of "erection work" will be considered all carpentry work connected with buildings that is performed outside of the shop. Here again will be found the strict specialization that characterizes modern methods of manufacturing; a specialization that makes for the utilization of the worker who performs a limited and restricted task, as against the all around workman.

After a consideration of the duties of the superintendent on a job, the requirements of the various foremen are taken up, These foremen are of five classes, all but one having to do with urban conditions. An analysis of the work of the various groups of journeymen completes this portion of the study.

The Job Superintendent supervises the construction of a building. As most erection work is performed by contractors the job superintendent must see to it that the various branches are co-ordinated and timed so as to be completed at the proper period. The superintendent is called upon to interpret the plans and specifications, and in many cases to make decisions, which in his judgment are for the best interests of the work. He must prevent defective workmanship or materials from entering into the construction.

After approval by the various city departments having jurisdiction, he lays out the lines of the building, in order that footings may be properly placed and leveled. He must pass on the value of each class of work in order to certify payments, and settle disputes between the different sub-contractors, occasionally arbitrating questions arising between co-ordinated trades.

The job superintendent should have a thorough knowledge of building construction, the demands of which vary with the magnitude of the work. For fireproof buildings he should have a working knowledge of the strength of materials, so that the steel work in the building may not be subjected to erection stresses beyond their capacity, such as may be produced by overloading with building material or derricks.

He should also have an understanding of mechanical principles as applied to machinery, elevators, hoists, pumps, and the like.

He should be thoroughly familiar with the Building Code, and

should have a knowledge of Workmen's Compensation Laws, and safety laws. He should understand rapid and economic methods of construction in order that the structure under his charge shall be erected in the shortest time and at the least cost. He should know the unit value on each class of work, and how to figure the amount in order to certify payments to sub-contractors. He should be conversant with rates of wages in the different trades and with trade conditions in general as relates to the supply of men and materials.

There is a job superintendent employed on practically all new work and on alterations of any size. Smaller jobs may be taken care of by the occasional visit of the job superintendent but on larger buildings the superintendent is assigned for full time to its supervision. He is employed from the time of initial layout to the buildings completion, being engaged, as a rule, at a yearly salary. On the superintendent largely depends the success of the contractor and the job. This position is much sought for because it is an excellent preparation for contracting. Due to the great amount of cheaper speculative work there has come about the hiring of a less skilled and poorer paid superintendent. These men are, as a rule, without trade training and with little practical experience. It is the opinion of all of the employers questioned that the most successful superintendent is the product of a thorough trade training with the addition of technical study. The scarcity of this type of men has led to the employment of college men with architectural or engineering experience. There is a splendid opportunity in this, the best paid of the building trade positions, to the ambitious mechanic willing to apply himself by outside study. Although trade experience may be obtained by a variety of work, many other things, such as the use of a level or transit, knowledge of strength of materials, principles of machine and electrical installation, elementary mathematics and physics and the elements of architecture as related to design are needed to meet the requirements of this position.

The Foreman on Wood Trim, with the assistance of a helper, checks the trim details as delivered on the job, and consults the drawings as to the places in which trim details are to be used. On large work he is assisted in this by check marks placed on much of the stock at the mill. He supervises the laborers in the distribution of the stock and supervises its erection.

He may have occasion to establish height marks and interpret drawings for the men. He keeps a record of time, when no time-

keeper is employed, and hires or discharges men as needed. When time permits he assists in the erection of the trim.

The Foreman on Metal Trim has similar duties to those of the foreman on wood trim, as concerns the distribution of materials, the establishing of bench marks and the interpretation of drawings.

Where he supervises the erection of the work noted under Metal Trim, most of his duties have to do with forwarding the construction, but when in charge of the erection of door bucks, elevator tracks and doors, and the better class of metal covered details, his duties are more complex, as shown in the description of this work under Metal Trim Erector. On account of the great variety and the frequent lack of competent men to perform this work, it is necessary that the foreman have ability to work on all of the operations.

The Foreman Joiner on Frame House Construction receives architect's details and specifications as well as lumber lists. While the masons are finishing the foundation work the foreman lays out the various pieces needed for the frame. When the foundations are ready the foreman supervises the placing of the sill and marks off on it the spacings for studs, corner posts and other details. He lays off like distances on girth, ribbon and plate pieces needed for the placing of the studs at upper floors.

He designates and supervises the methods of covering the frame, placing bridging, laying the rough floors, placing and covering the roof, and assists the journeyman in locating positions for outside trim, cornices, covering, etc., making simple working drawings on boards or other materials, to assist in locating or checking distances. He advises as to methods of fitting around work of other trades, such as applying flashing, obtaining cuts, spacing of trim, sequence of operations, layout and erection of scaffolds, application of covering on roofs and side walls, and the layout and erection of porches, bays, etc. When trim arrives he checks up the sizes and has it distributed, assembled and applied. When not otherwise engaged he works on the cutting, fitting and erecting of materials.

The foreman should be able to read blue prints and specifications and make simple full size details bearing on construction problems. He should be familiar with the Building Code as concerns the carpenter; have a knowledge of building routine, listing and ordering stock, with its gradings and sizes, the use

and care of tools, as well as an understanding of all the other elements entering into frame house construction.

The foreman should be able to lay out roofs, arches, simple trussed and braced forms and understand simple geometrical layout of angles and cuts for coverings, etc. He should be familiar with the names, kinds, qualities, uses and values of wood, hardware, roof coverings, insulating materials and other building materials; be able to make simple estimations for quantities, and have a practical knowledge of the strength of beams, girders, trussed and braced forms to enable him to use and place material efficiently. It is desirable that he should be able to make ready use of the formulas in the wood-workers' hand-books. He should be able to handle men and have the work performed economically.

The Foreman Frammer orders materials and checks the sizes of material as delivered, grouping his men for carrying, piling and cutting. By noting the sizes marked, or by scaling the floor plans, he notes that these agree with the Building Code, and making allowances for subsequent details, lathing distances, stair wells, chimney breasts, partition distances, etc., he arrives at dimensions and quantities of floor members needed for the work. The foreman marks off pattern pieces, denoting by a number on each the number required. He lays out on headers, trimmer, and girders the marks needed for special cuts.

He must check the work of his men to see that they cut without undue weakening of the members. When metal framing accessories are not used, or required by law, he may have occasion to lay out mortise and tenon, tusk and tenon, gained, notched, coggled or other joints, or insert ledge pieces, steel angles or other materials to carry adjacent members.

The foreman lays out the pitched roof members to suit the detailed requirements, using some method, such as the steel square, to obtain lengths and cuts. He allows for the covering of the roof so that the material may be applied properly and he may have occasion to lay out and supervise the building of rough work to receive cornices or decorative details. As the work progresses he must make allowance for the work of the other building trades such as the plumber, the steamfitter, the electrician, etc.

He should be able to read plans, elevations and specifications, estimate quantities, time and prices, make out stock lists and order materials. He should understand wood joinery that has to do with framing and the allowances for metal accessories,

such as straps, bolts, anchors, stirrups, etc. He should know how to lay out braces, shores, roof members, curved and irregular work, as well as to make allowances for the work of other trades and the code restrictions.

He should understand the construction of mill framing, bridge, elevated structure and dock work, as well as the construction of trusses and heavy centering, and be able to rig hand power hoisting devices.

A knowledge of geometry sufficient for the laying out of curves, angles and triangles is desirable, as well as an understanding of common fractions, decimals, square root and simple formulas.

The Concrete Form Foreman has charge of the construction of concrete forms. He receives from the contractor, floor plans and elevations, with special details where needed.

On small jobs he may be required to lay out his own batter boards and building lines. On large work, with lines and bench marks laid out by the engineer, he obtains wall and pier locations, also column centers. From section drawings he obtains the sizes of the footings and assigns men, usually in pairs, to the making of the forms. He specifies the materials to be used, also the method of construction, giving the men blue prints, or making sketches for their guidance.

He plans the construction of forms so that they may be removed without damage and used over again on repeated details in upper floors. He checks his material to see that it is seasoned sufficiently so that it will not buckle, warp or twist when in contact with wet concrete.

He considers the bulk of concrete, making his thickness of stock cleating, bracing and nailing so as to withstand the stresses brought on them by the liquid mass. In the construction of columns, he plans that the concrete may be strongly intersected with the girder and beams, and braces the forms to keep them plumb. When footings, columns, piers and side wall forms are finished, he has the forms for lintels, beams, girders and slabs made up and erected, noting that allowances are made for corbel, beam and panel finishes. He indicates the number, sizes and construction of struts under the beams, and introduces wedges for truing them.

The Foreman—Erection Work: In buildings of any magnitude a foreman is employed for each branch of work. On smaller jobs, on routine work, and also on larger jobs under a general

foreman, there are numerous minor supervisors called "straw bosses" or "snapper" foremen. Their work consists principally in keeping the men busy, solving minor construction problems and interpreting blue prints. The wages of these men are rarely more than those of the journeymen and they will not be considered under this head. The foreman is, as a rule, employed throughout the year, being engaged when time permits or during slack season on journeyman work. His salary on union work varies from a minimum of fifty cents a day above the journeyman rate as specified in the trade agreement. The competent foreman is in line of advancement to the positions of superintendent or employer. Due to the great amount of speculation work and specialization, there is less demand for the competent foreman than formerly. His place is being taken to a considerable degree, by the so-called "straw boss" and on "lumper" contractor work by the employer who acts as foreman. Only on the finishing of the finer private house and public buildings, as well as on the construction of the better class of suburban frame houses, are the services of the older type of foreman needed. Knowledge of blue print reading, estimating quantities and drawing, necessary for laying out, can best be gained through outside study, and study of the technology of wood and methods of building construction would also be of assistance. There is need for a great many competent foremen for concrete work, who require special instruction, as regards the properties of concrete and the materials entering into forms, the principles of concrete construction and form layout. A study of the special provisions in the Building Code is also desirable.

The Trim Joiner on Private Houses and Work of the Better Class: In this work the joiner occasionally does the work of the framer. He also nails grounds around door and window openings, making them plumb and true. After the plasterer has finished his work, which is trued by these grounds, and the plaster is dry, the joiner erects the trim. Sash, with glass set and with wood surface primed, is fitted into place. In houses of the better class the trim is placed before the floors are laid. The door jambs, made in the shop to size are assembled to be nailed into place with blocking to hold them and to receive screws for butts and lock strikes.

In the trimming of windows the joiner nails the casings in the grooves of the box frame which was set when the walls were built; he fits the stools, and cuts reveal jambs to lengths; cuts

dadoes in the reveal head jamb; nails jambs together, places tongues of same in the window frame casing groove, and fastens them in place by nailing. Panel backs are fitted and fastened.

Such work as cutting and fastening window stops, cutting and fitting window jambs, setting door jambs, casing openings, scribing mantels, assembling and scribing dressers, cutting and nailing base, fitting and hanging doors, fitting and nailing saddles, fitting and hanging sash, etc., is generally divided so that a joiner often works in one division for days at a time.

In fitting doors the joiner planes to widths and squares the door top from the side. After the floor is laid he fits the bottom and puts on butts and locks.

The trim joiner should be able to read detail drawings. He should know the sizes and heights of counter tables, shelves, doors, etc., and the sizes and heights of plumbing, electrical and other fixtures for which he has to allow and have a knowledge of the Building Code as it concerns his work in relation to fire-proofing, stair construction spaces, door and window openings, sizes and widths of halls and entrances, swing of doors, etc. He should understand the technique of wood as concerns shrinkage and distortion and its proper disposition in building construction.

The joiner must be able to measure and mark distances quickly and accurately and use the tools common to his trade with skill. He must also be able to use some of the common tools of allied trades, as a drill for brick work, tinner's shears and hack saws.

The Trim Joiner on Work of the Cheaper Class: In all of this work men are assigned to narrow divisions on which they specialize for days at a time. The trim joiner sets and straightens grounds before the lathing and plastering is done so that he may have a proper foundation for the trim. The worker is given door jambs, either knocked down or assembled, which are made to almost an exact size as to height, and the door head is dadoed to the sides the width of the opening required. The stops are fitted and fastened in place.

Extension window jambs are made with tongued edge and are longer than needed so they may be cut and fitted on the job. Casings come, as a rule, put together, to suit the various sizes of door and window openings, although in some sections of the city this material is sent in lengths, made in pairs, with mitres out on ends. These pieces need only be cut to exact lengths,

glued and nailed, with no reinforcement as is provided in shop made trim. Occasionally jambs are sent with one side of the trim fastened to it, but base, picture, and other mouldings are sent in stock lengths to be cut and fitted on the job. Window sills are sent cut to lengths with mouldings returned on the ends. Shelf cleats, shelves and other straight stock is sent in bundles, in lengths that allow for fitting as needed. Kitchen and closet wood work is sent from the shop as nearly completely assembled as is possible. As the work progresses some men are assigned to fitting sash and others to hanging it. The majority of trim joiners are specialists, and on the cheaper class of work, of foreign birth. Their success depends largely on speed in the assembly of trim details rather than accuracy. The work of a better class, though a small part of the total, calls for the employment of workers with a fair degree of skill and knowledge of assembly of complex details. These latter positions are held as a rule, by men with an all-around training, and if of foreign birth, not of recent immigration. Survey visits indicate a shortage of the latter class. The trimmer on cheaper work suffers a great loss through unemployment, although many were found who worked at times as bench hands, jobbing carpenters on cheaper work and on fixture erection. For the cheaper class of trim work the job gives all the training required. For the work of a better class, a knowledge of blue print reading, sizes and construction of building details and the properties of wood is essential.

The Carpenter and Joiner on Frame Houses of the Better Class: The carpenter-joiner on frame houses works usually with a partner or apprentice under the direction of a foreman. Such groups first saw to length and cut out the joints on all members needed for the frame of the house; gains for joists, or other cuts are made as marked; girders or other heavy pieces are sawn to lengths noted; corner, and other posts are cut, to receive the various members and are placed in such position as to be easy of access in the process of erection.

When braces are called for they are cut to the angles marked by the foreman. Repeated members, such as studs, joists, rafters, etc., are marked and cut to patterns previously laid out in sufficient numbers to suit the amount called for on each pattern. Mortises are bored and cut. Tenons are sawn, chiseling being resorted to for trimming.

When the rough members of the building frame have been cut, some of the men are assigned to the job of erection. They place the sill and girders, noting their position by check marks, nailing splices and lapped corners. The assembly of side walls is accomplished in sections, where possible, the parts being nailed together on the ground, and, when complete, erected to their proper position. Other walls are then erected and members that intersect are properly fastened and braced to be plumb and level. Mortise and tenons on headers, and tail joists, are assembled and nailed, stirrup irons or hangers being inserted at the trimmer to carry headers.

The work proceeds to the placing of rafters, often at the expense of erecting special scaffolding. When the frame is up the men commence boarding in the side walls, covering same with matched, lapped or square edge boarding, as called for in the specifications, this sheathing often being put on at an angle in order to brace the frame.

Roofs are boarded, leaving spaces for ventilation of wood shingles, with strips at the proper distance to receive shingle nails.

Bridging stock, sometimes cut at the mill to suit standard spacing, is stuck with nails and fastened at the top. Rough floors are laid in about the same manner, as the sides are boarded, but the job of face nailing is done at the one operation. Partitions are cut from patterns laid out by the foreman for the various studs. Sole and cap pieces are cut and laid out to suit lath sizes and openings. Bridging is cut and placed over the door openings, or to support partitions, while ceilings are furred and the underside of the bridging nailed. Grounds are nailed and made straight. Insulating paper is placed on the outside walls and window and door frames are fitted, leveled and fastened. While the lathers are at work the men cut, fit and fasten outside trim, build on porches, etc. They cut and fasten siding, noting the spacing divisions, first sawing pieces to lengths and smoothing the ends by planing to fit trim where needed.

Shingling of the side walls and roofs is often laid to a strip, rather than a chalk line, and spacing divisions are checked so that the completed surface shows a correct alignment. Flashings are inserted where needed, metal gutters and valleys are

placed for shingling, and when the outside work becomes scarcer, some of the men are laid off until the plastering is completed and ready for trim. The men best suited for this work are retained and used on minor construction, such as the finishing of porches, making of cellar partitions, etc. The casing of doors and windows, the fitting and nailing of bases, the application of moulding to same, and the fitting and setting of special fixtures, such as sash, mantels, cabinets, etc., as well as the fitting and hanging of doors, differs little from work described for the trim joiner.

The carpenter-joiner often lays the tongue and grooved flooring in private houses, but parquet flooring is always laid in these houses by a specialist. After the floors are laid he fits and fastens the saddles, scribes and fits doors to them, cuts and fastens cleats and shelving, as well as other minor jobbing details needed. Stair work is invariably the work of the specialist.

The carpenter-joiner should be skilled in the use and care of the tools of the framer and joiner. He should understand building frame types, methods of laying out joints, methods of bracing, bridging, trussing, etc., erection of scaffolds, outside trim cutting, fitting and assembling and the handling of insulating materials. He should understand the use and application of flashings, methods of fastening wood to other materials, the precautions to be observed concerning weather conditions as affecting gutters, construction of joints, setting of trim, priming of joints, etc. He should be able to make simple the geometrical layouts needed for the angle cuts of the frame, covering, flooring, trim, etc.

The Carpenter-Joiner on Frame Houses of the Cheaper or Speculative Class works under conditions requiring the erection of structures in the least possible time and with a minimum cost both of materials and labor. These conditions encourage the slighting of finish, accuracy and strength, but otherwise, the work is of much the same character as outlined for the carpenter-joiner on better class frame construction. So highly specialized has this speculative work become, that it is possible to build a row of houses in as short a time as twelve weeks, with a small force of men. A very large proportion of frame construction in the suburbs is of this class. As noted elsewhere, the construction of frame houses represents a considerable item in the work of this city. The remarks upon training and types of men under the trimmer apply also to the carpenter and joiner, but the nature

of much of the work on non-union jobs, even of the better class, enables the use of men little better than common laborers for carrying and placing joists and frame parts, sheathing and laying rough floors, shingling, etc. A great deal of this work is of the highly specialized and speculative small house type and is not unionized. The wages on this work, especially during dull seasons, are found to be extremely low. Men classified as helpers, but doing rough carpentry, receiving but \$10.50 a week were noted.

The Wood Stair Builder on Houses of the Better Class receives from the shop the various details needed to construct the stairs, i.e., carriage pieces, stringers, treads, risers, newels, hand rails, balusters, mouldings, material for landings, etc., together with the blue prints, shop and other details needed to erect the work. This stock usually comes completely machined, with an allowance for job fittings on ends of treads and risers, hand rails, newels, walls and other string pieces.

As the methods of stair construction vary the assembler must carefully note by looking over his stock and details the type of construction and allowances for fitting. After the straight stock is assembled, he fits and places starting steps and newels, cuts and fits brackets, curb panels, hand rails and other parts, noting their alignment with work already set. He then inserts balusters, usually cut in their proper lengths, gluing and otherwise fastening them as is called for.

The stair builder should understand the use and care of the stair erector's hand tools and be able to read blue prints and shop details. He should have a knowledge of the construction of stair wells as concerns studs, joists, headers, trimmers, etc., and should know how to fasten his work to wall materials such as brick, terra cotta, plaster and other partition stock as well as the proper means of bracing and holding during erection. He should know the rules, as to riser heights, pitch, head room, easements, line of travel, etc., as well as the restrictions of the Building Code covering stair construction.

The Wood Stair Builder on Speculative Work receives from shop, stair flights almost completely assembled, which he has simply to raise into place, level and fasten by nailing to the studs, after which he sets the newels in their fitted places and lays platform stock on framed landings. As the flights are fitted and fastened into place before the final coat of plaster is applied, the need for accurate joinery is, to an extent, eliminated.

Little time can be spent on careful fitting or in instructing a helper, when a man is required to erect straight stairs often at the rate of about six in one day, assisted by a laborer for the lifting. It is often required that the stair builder trim three flights of stairs, with outside panels, hand rails, balusters and fascia boards, where such are needed, in about twelve hours, as well as fasten the cellar stairs in place and cut and nail a simple hand rail and newel to them.

The assembler on this work needs little knowledge other than that relating to the use and care of hand tools, with methods of leveling and holding work. He should understand the construction of well holes for stairs, so that he may make proper fastenings. He should be able to read simple sketches, denoting sizes and position of work.

As has before been pointed out, the work of the wood stair builder in other than the suburbs is very limited. What has been said of the carpenter and joiner applies to a large extent to the stair builder. These men work between shop and job where time allows. The nature of their work does not induce crossing over into other divisions. Their slack season is naturally that of the carpenter and joiner. The wood stair builder of the better class must rely upon outside study to obtain much of the technical knowledge needed for laying out his work. For work of the second class little more than a knowledge of blue-print reading is required.

The Metal Trim Erector and Bronze Worker who erects calaminated doors, special trim, etc., receives stock which has been assembled in the shop to as complete a stage as possible. This may consist of doors made to size with door casings and joints cut to the lengths required for fitting. In the case of door pediments, etc., this stock is almost completely assembled in the shops. Back bands, corner moulds, etc., are sent in lengths to be cut on the job by hand and fitted into place. With this stock comes a list of sizes, if needed, and a layout.

The erector consults the detailed drawings, makes a layout rod, if required, and commences assembly. He sets his jambs, or other foundation pieces, accurately, making them plumb and level when needed, and fastens same in place so that the fastenings are covered with subsequent trim when possible. He cuts this trim to required lengths using the tools noted for the metal trim joiner.

He should be able to read blue prints and full-size layouts. He

should understand construction details adjacent to his work, *i.e.*, jambs, partition, steel frame work, as well as the methods and materials used in fireproof construction.

The Metal Trim Joiner receives metal, or metal covered mouldings, needed for chair rails, picture mouldings, casings, etc. He marks lengths and cuts the pieces, using a hack, or panel saw, designed to cut metal. He nails these mouldings into place. In case of hollow steel or other thick metal, he has to bore these with metal cutting bits to permit of nailing or other fastening. He may have occasion to file metal intersections. Metal bucks or jambs have to be bored and tapped to receive the screws for butts.

The metal trim joiner should have a knowledge of metal cutting tools as needed for metal trim. He should also understand the methods of wood joinery as related to trim, *i.e.*, butt, coped, mitred, scribed and other joints. He should be familiar with building construction in relation to his trim, should understand the reading of blue prints of simple trim details, and be able to arrange simple jigs and devices for holding, cutting and measuring. On account of the Code requirements relating to fire-proofed buildings, this work is rapidly extending, although confined as yet to the larger and more important structures. As most of these buildings are erected under union conditions the union scale is paid. For work of the better class a skilled mechanic is employed. On account of the comparative newness of this work the all-around highly skilled wood trim joiner with some metal working experience is apt to be preferred. Specialists, however, are being developed who bid fair to do most of this work because of their special effectiveness and more rapid work. Although the routine work of the trim joiner is rather limited, it affords a training which allows the more apt workers, after acquiring experience in layout, blue-print reading and methods of instruction to advance to the better work where good workmanship rather than speed is required.

The Journeyman Framer arranges floor beams in piles so the foreman can lay off dimensions, cuts, lengths, etc., on same. After pieces for each floor are cut he assists in carrying the pieces to their positions. For more efficient performance of this work he may be called upon to rig a hoist. He sets brick centers, usually made in the shop, braces and levels them. He sets and braces window frames, making them plumb and level. He sets wood lintels or may simply cut same to length, leaving the setting to

the mason. After floor beams are laid he is called upon to lay the under floor. From this floor the masons work to erect the walls to the next height of floor beams, where the process described is repeated. The rafters and roof beams are placed and sawed and covered in the same manner by the framer.

When two or more floors have been finished, partitions are laid out, pieces cut and erected. After the main studs have been fastened in place and the partition aligned, the framer sets his door studs. When a ceiling is furred the framer nails pieces of 1-inch by 2-inch spruce, or other cheap wood, to the under side of the floor beams.

The framer should understand the use and care of the common tools used in the work, the meaning and value of the Building Code regulations as regards cuts of beams, methods of fastenings, sizes of openings, etc. He should understand methods of constructing simple hoisting apparatus, such as the block and tackle and the principles involved. He should know various ways of tying knots and splicing of ropes and beams. He should be familiar with methods used to overcome or minimize the sagging and twisting of beams. He should understand the layout and making of framing joints, *i.e.*, the mortise and tenon, the ledge, the gain, the housed, etc., and should know the methods for framing stirrups, bridle irons, hangers, strap anchors, etc. Much of the suburban work is not unionized and a scale of wages lower than the union scale is paid. Much of this work is done by foreign born workmen. When work is dull framers often engage in the simpler kinds of concrete form making. There are also many who take up the laying of tongue and grooved flooring.

In Manhattan Borough there has been a lessened demand for framing of late years, but this has been more than compensated for by the erection of apartment houses in the other boroughs.

The tool technique of this work is simple, accurate cuts not being essential. A strong physique and skill in walking with heavy loads across narrow walls and planking at dangerous heights is a prime requisite. For this reason many ex-sailors are employed at this work. Outside experience in joinery is of assistance in enabling the specialist framer to engage in other branches when his particular work is dull. A knowledge of construction and the reading of blue prints is needed by at least one in each four of each gang of framers.

The Floor Layer lays finish floors of various woods suitable for the purpose. These woods are laid straight or to a varied design, often with an insert of another kind of wood. Where

a border is required on fireproof construction, it is necessary, as a rule, to have the floor layer lay the sleepers needed for the nailing of the floor in place. The finish flooring is sent from the mill in varied lengths, often bundled. This is hoisted, or otherwise passed to the various floors, being distributed by the men at the foreman's direction and placed in such position as to need little rehandling. This stock is, as a rule, $\frac{7}{8}$ -inch thick and a uniform width for each kind of wood on the job, with a tongue and groove joint on edges and ends. The standard widths vary, being usually less than $3\frac{1}{2}$ inches. The floor layer receives directions from the foreman as to the design, quality of the job and sometimes as to the process of laying. He cleans off the sleepers and lays building paper if needed. In the case of a border he lays his pieces against the walls scribing them to fit the base set by the joiner. After the border is laid he places his center, selecting his lengths so that joints will not come adjacent to one another and laying the pieces selected in a way to reduce the waste from end cutting to a minimum. In nailing he drives the cut nail in such way that it does not split the board, toeing the nail so that it will draw the board up to make a tight joint with the last board laid.

Floors are smoothed by means of a device called a scraper which is manipulated from a kneeling position. For the truing of surfaces requiring considerable removal of wood a plane may be used. There are numerous scraping devices having heavy blades and long handles attached which can be worked from a standing position.

Sand papering is usually done by hand, with the paper placed on a block or on a handled weighted device which enables the worker to sand the floor from a standing position. There are numerous electrical driven devices that sand paper the surface true and smooth at the one operation. On most work, however, hand surfacing is done. The floor layer should understand the various woods as to working and warping. He must know how to make simple geometric patterns with straight flooring material and how to lay out the angles needed for his designs. On fireproof construction, where he must lay sleepers, the floor layer must know the use of bench marks, methods of truing and leveling sleepers and how to fasten them.

The Parquet Floor Layer receives from the flooring shop pieces of tongue and grooved stock made in short lengths and of such shapes as to fit a design laid out by the shop draftsman. These

pieces are tongued and grooved on the ends as well as the edges and for other than wood carpet they are about 13/16-inch thick. Borders may be of long stock of the same thickness or of 5/16-inch strips assembled to some geometrical design, built up on a 1/2-inch base. The floorlayer receives a shop drawing for the assembly of work of a better sort but verbal directions and simple sketches only are given for common work. He lays a thickness of building paper over the under floor, makes a layout and begins assembly by laying borders, toe nailing tongue and grooved stock. He may cut joints to a herring bone, or other design, but borders of a design peculiar to parquetry need only be cut and fitted, being faced nailed into place. The floor layer fastens starting pieces, cutting a groove and gluing and inserting a tongue by hand, where one is not provided. He continues the assembly from these built up pieces with stock of a machined length which need be nailed only. He cuts grooves on ends that must be cut to fit as he approaches the other side of the room, gluing and inserting tongues into these adjacent grooves. After the floor is laid he sets all face nails to allow for puttying after surfacing.

The floor layer should understand the reading of parquet floor layout details, know the kinds of woods used for floors and their qualities. He should know the different methods of floor laying, *e.g.*, tongue and grooved, parquet, parquetry and fireproof types of floors and understand methods of truing and testing surfaces, as well as the use and care of the tools of the trade, with special knowledge as to hand and machine scrapers, sandpaper and sanding devices. He should also possess a knowledge of wood finishing as concerns flooring. Almost all of this work is done by specialists. The work of laying simple tongue and grooved stock is quite easily learned, whereas the laying and finishing of parquet floors requires much of skill and experience. On account of the arduous nature of the work a slight increase over the union scale is paid. A few non-union jobs were visited where this was not the fact. There is an increased demand for floor layers, especially those able to do parquet work, due largely to the fact that only men with particularly strong physique remain steadily at this work. Rarely does the worker on simple floor laying acquire a skill that enables him to engage in other lines. Where the worker wishes to change to more skilled work he must acquire tool practice outside.

The Fixture Assembler erects partitions and other hard-wood fixtures. He receives from the shop the partition, or other fix-

tures, partly assembled, with surface finished. With the material there come drawings to scale, often with key numbers corresponding to numbers on the work.

From the figures or scale dimensions on these drawings, the required distances are laid out on the floor. A trial assembly is made, door openings and pilaster places are check marked and holes are bored in the floor which is often of concrete. Such holes are filled with a wood plug, into which nails may be driven in fastening the partition. Metal dowels set into drilled and cemented holes may be substituted for this method. After the pilasters, base, cap and other parts are assembled pieces are scribed by the worker to fit the walls and ceilings, frames or other head pieces being scribed around beams and girders. He then cuts the base and base moulding, cornice and pilaster mould to lengths, scribing, fitting and fastening them securely into place.

The fixture assembler should be able to read drawings and layout scale, figure distances from them, and divide spaces proportionately. He should be able to arrange jigs when needed to hold work during assembly. He should have a knowledge of the hardware needed for office fixtures, understand its application and know the methods of boring walls and floors to insert fastening devices.

There is a cheaper class of fixture joiner, who as a rule works with soft wood, making work-table, bins, shelving, and similar fixtures needed, for example in work-rooms in loft buildings. He works from simple sketches or verbal directions given by the foreman, or owner. Often sketches are made in chalk on the floors denoting the plan size of the fixture.

As a rule, the material for such work is delivered at the job in lengths and finished by hand to the sizes needed, widths often having to be ripped and edges planed. Few cuts other than those needed for a butt joint are made as the shelves are, as a rule, supported on cleats, or by nailing, dado or other joints being made in the shop.

Table tops, bin covers, etc., are made up of tongue and grooved stock with battens nailed or screwed to the back and ends of shelves are roughly scribed to the walls, the worker being assisted by a fellow workman in their erection. The joiner plugs the wall or floors where needed, or inserts special bolts, or other fastening devices.

The loft joiner must be able to estimate and measure lengths of stock, mark and cut them to sizes quickly, to use the tools of

his division dexterously, particularly in sawing and planing pieces to size and nailing them together where needed, in fastening cleats, and in scribing and fitting pieces to the walls or floor in a fairly accurate way. He should understand the practice of fire-proofing bins and material around heating devices and the methods of fastening his material to brick and other walls, using toggle, expansion and other bolts in this work. This is a division employing a large number of workers and the work shows a wide variation in the technique required. Many of the workers do not belong to the union and there is, therefore, great difference in the wages paid. For the erection of fixtures of the better class a highly skilled worker is employed because of the accuracy needed in fitting and erecting the parts. Such workers often engage as bench hands in shop construction and also as joiners on wood trim. Although there is a decrease in the number of local shops devoted to the production of these details, there is an increased demand for erectors because of the increased use of partitions. There is no shortage, however, in workers because trim joiners seek this less strenuous work. On the simpler details oral directions and the following of guiding numbers are all that is required. On more complicated work reading of blue prints or details and skill in layout is essential.

The Jobbing and Alteration Carpenter engages in practically all of the divisions of carpentry and joinery, making repairs and alterations. Rarely does he have anything to do with metal trim or concrete forms. He may be called upon to cut and alter the house frame, cut through brick walls, set studs and partitions, lay or patch floors, insert new stair treads, repair or make doors and windows, glazing and puttying them if needed.

The jobber may make and hang screen doors or repair and adjust locks, door checks or hardware and, if occasion arises, lay out and construct wood store fronts, repair furniture, insert new sash cords, and put up shelving or other fixtures.

In suburban sections this routine may be varied by repairs or construction of outside steps, fences, blinds and sheds, as well as the weather-proofing of roofs and walls with shingles or other materials.

The jobbing and alteration carpenter must be an all-around man, having ability to make and read simple construction and alteration details. Occasionally he must make simple drawings showing the elevations and details of work under consideration. He should be able to make simple estimates of material, figure

costs and make out stock lists for ordinary material. He must have a general knowledge of all types of building construction.

He should be familiar with the more common kinds of wood, understanding enough of their quality, technology and care to enable him to use them intelligently. He should know how to lay out and construct the common joints, and be familiar with the stock sizes of materials, *i.e.*, wood, hardware, sash, doors, glass, etc. He should understand enough of framing to enable him to lay out and build simple structures, inserting bridging, trusses, or strengthening parts intelligently. He should have some knowledge of the construction of doors, from the simple batten to the occasional panel door not purchasable from stock. It is important that he know the standard sizes and heights of common fixtures, such as tables, chairs, counters, shelving, etc., as well as understood methods of weather proofing, weather boarding, and composition roofing.

He should be skilled in the use of all of the wood-worker's tools and be able to use plow and rabbet planes to produce work ordinarily done by machine tools. A great variety of workers are employed in jobbing shops ranging in ability from the semi-skilled handy man to the all-around mechanic. Workers in such shops do not often belong to the unions and their wages vary considerably. For the better class of jobbing a skilled and well-informed worker is needed. The demands upon him are such that he must be able to perform practically any kind of carpentry, although he rarely possesses the speed of the specialist. Although fireproof structures eliminate much of the jobbers' work, there is still a very considerable demand for work of this kind. A jobbing helper has the opportunity in many shops of obtaining excellent tool experience, but such work as drawing and estimating with a fuller knowledge of construction, must be obtained by outside study.

The Concrete Form Joiner is assigned, usually with a partner, to the making of the forms needed to receive the liquid concrete and hold it to the required shape until it hardens.

He works on rough and dressed stock of various sizes, from $\frac{7}{8}$ -inch to 2-inch thickness, for forms and braces, and from 1-inch by 3-inch to about 3-inch by 4-inch for struts, standards, etc., North Carolina pine and spruce wood being commonly used.

Form for footings are roughed out and nailed together, bracing and holding them in places noted on the blue prints by using pieces driven into the ground. The forms for walls, col-

umns, piers, beams and girders are built by sawing stock to lengths, cleating and fastening it to unit forms that may be used over again on repeated parts. The form joiner saws clean-cut space pieces in column bases, arranging them so that they may be inserted and fastened before the concrete is poured. He saws out and assembles struts, braces and cross pieces, inserting wedging and footing pieces to allow for the truing of beams and girders. He constructs boxing for corbels. To prevent column forms from spreading when filled with concrete he assembles milled stock to form yokes, or makes yokes from wood pieces with wedger or bolted corners.

The form worker inserts and fastens into place nailing blocks, socket pieces, shaft hanger, electric, steam and sprinkler fastenings, so that they will be embedded in the concrete. Where needed he cuts and fastens wood pieces into forms to produce pocket spaces for beams, window and door rabbets, expansion joints, flashing spacing, etc.

He must erect scaffolding to enable him to assemble girders and beams, in doing which he fits and nails ledger pieces, cuts and fastens joists and lagging, chamfering corners on surfaces next to the concrete so they will release easily, making the assembly so that it can be removed readily and used over again. Where continuous walls are built the worker constructs slotted or movable standards, arranged for re-erecting strips, bores for and inserts wires, ties or bolts, which he tightens to hold forms to the required position.

In the construction of stair forms he lays out stringer pieces, obtaining the run and rise as noted in stair building. He builds forms for landings where these were not made when other details were erected, builds soffit panels, cuts and places beams and shoring, erecting stringers and soffit pieces so as to allow for concrete thicknesses. The worker cuts, places and fastens risers, builds stair curb boxes, inserting and temporarily fastening hardware, such as sockets needed for railings which are to remain imbedded in the concrete. Often, wood and metal trim is inserted as part of the forms so that when the concrete is poured and hardens, they are firmly imbedded. Cornices and ornamental detail forms are built of stock delivered in milled shapes and random lengths. The worker saws, fits and fastens this in about the same way as a joiner builds wood cornices.

One of each pair of concrete joiners should be able to read blue prints and sketches, but each form joiner should fully un-

derstand the methods of making, erecting, tying, bracing and shoring forms, as well as bringing them into alignment. He should know how to lay out and make yokes, simple centers, stair strings, braces and struts, and understand the use of wedges to hold, strengthen and align work. He should also know something of the fixtures imbedded in the work so as to place them properly. The number employed upon this work is considerable and most of the work is unionized. Men trained only in this branch find it difficult to engage in other divisions of the trade. This type of work is increasing in importance and the demand is particularly felt for those skilled in ornamental work and the construction of complex details. The work needs a good physique as it is performed in damp surroundings and requires much heavy lifting. Often work has to be done at dangerous heights.

The Concrete Form Stripper works under the direction of the foreman, greasing the forms before the concrete is poured into them, stripping the forms from the walls and other details after the concrete sets. He works with a ripping chisel, wrench, hammer and hatchet, and arranges slings and tying devices to enable him to raise and remove the forms from their designated places. He is checked with reference to the time and removal of these forms, so that braces shall be allowed to remain until beams and other concrete parts have obtained the required bearing strength. The concrete stripper would not be considered in the finding were it not for the fact that many of the form makers are obtained from this group. These workers by changing employment now and then pick up enough training to enable them to obtain a job as form builder.

SUMMARY OF THE TRADE FINDINGS

The trade of carpentry and joinery represents some 55,000 workers in Greater New York, distributed among a large number of small jobbing shops, a small number of large factories, and those finding a shifting employment with contractors who oftentimes possess no shop at all. They show a trade where fair wages obtain in union shops and a trade that is largely affected by seasonal demands.

The past twenty years has witnessed the decline of carpentry and joinery as a trade from one of the best among the building trades, considered from the standpoint of regularity of employment and relative wages, to one of the poorest. The all-around

man able to engage in any of the divisions of wood working, who was formerly so essential, has become a great extent a thing of the past.

Although as shown by the study of specialized divisions, there is need for a large number of highly skilled men in this industry, yet in comparison with the total workers employed, this number is very small. The demand in this industry is for the specialist whose success depends often on the quantity rather than the quality of work he performs. The skill required in many of these divisions is most elementary and the labor supply is greater than the demand, yet in some of them, because of the speed element, the wages demanded are relatively high.

As has been noted the strong tendency in New York City is to limit carpentry work in new construction to assembly and erection of details prepared in mills largely outside the city. Many shops in the city that formerly used the dull season to prepare standard trim and window frames have abandoned the practice, thereby increasing the unbalanced labor conditions and further emphasizing the seasonal character of the trade.

The Carpenters' and Joiners' Union seemingly anxious, not only to protect their membership, but insure a supply of competent workers, have been compelled with the changed conditions and methods of construction to accept more and more limited requirements for admission to membership. Apprenticeship is practically a thing of the past, the workers being recruited either from helpers in the various branches who are rarely engaged under eighteen years of age or from mature workers coming into the city from the outside.

Although it was the opinion of the large majority of the employers questioned that the specialist was best when trained as an all-around man, yet questions asked of the workmen brought out the statement that employment is based invariably on previous experience in a particular line, and that little consideration is given to breadth of training.

What are the needs of such a trade as regards instruction? For the typical worker—the specialist—it is evident that the range of skill and knowledge required is comparatively narrow and that both, in most branches, can be largely picked up in the practice of the trade. In a few branches there would appear to be a need of short technical courses for those working at the trade which could be supplied by evening classes.

For pre-employment classes taking boys from fourteen to six-

teen years of age, there would seem to be but little place. Both the specialized character of the industry and the lack of an apprenticeship system represent conditions that offer little reward for attendance in such courses.

It would seem that the office of such classes could only be to instruct a few boys who, by virtue of superior breadth of training, would have an added chance of becoming foremen, supervisors or high-grade workmen, and who would find openings with employers who engage apprentices or young workers at sixteen years of age, especially if they are of strong physique. It may be noted that such classes would also serve to train for the furniture trade in which a considerable number of young workers are employed.

OUTSIDE AGENCIES FOR THE TRAINING OF CARPENTERS AND JOINERS

CLASSES ESTABLISHED BY THE BOARD OF EDUCATION

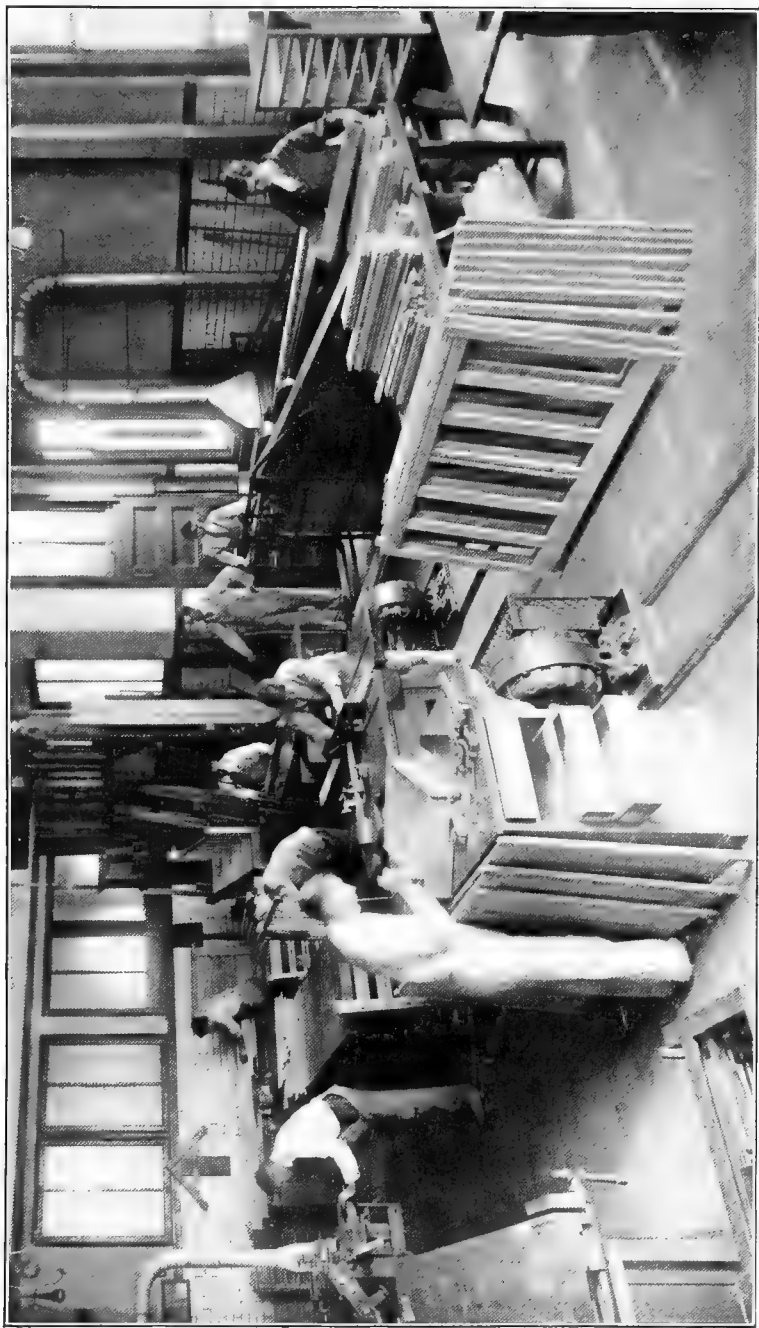
The Board of Education has established three trade preparatory courses in woodworking in the three vocational day schools and trade extension classes in carpentry and cabinet making in seven evening trade schools. The following paragraphs describe very briefly the work carried on in these schools. Additional information concerning these classes is given in part five of the report.

Day School Courses: The courses offered in the three day vocational schools are open to any boy fourteen years of age who is a graduate of the elementary school or who can show that he is prepared to take the work by successfully passing an examination given by the principal of the school. The courses are two years in length and the boy spends one-half of his time in the woodworking shop and the remainder of his time in drawing, mathematics, science and other subjects.

The courses in woodworking do not attract large numbers of boys. In March, 1917, there were sixty-five boys in attendance in the woodworking classes in the three vocational schools. Thirty-two of these boys were in woodworking courses at the Brooklyn Vocational School, nineteen at the Boys' Vocational School and fourteen at the Murray Hill Vocational Schools. Five teachers were employed for these classes.

The courses offered at the three schools are not uniform in character. The boys in the Boys' Vocational School spend one-third of their time in each of the following departments; cabinet work, house construction and mill work. Considerable emphasis is placed on manufacturing a commercial product for the Board of Education. The work in house construction consists of building a small house and working out special problems in framing. This type of work was not found in the other vocational schools.

The woodworking course at the Murray Hill Vocational School was greatly handicapped by lack of room and equipment. The work consisted of hand tool work as there were no machines provided for this school. The work at the Brooklyn Vocational



CLASS IN WOODWORKING—VOCATIONAL SCHOOL FOR BOYS

School consisted of hand and machine work. The work in this school consisted largely of making small pieces of furniture which the boys took home.

Evening Trade School Courses: There were seven trade extension courses in carpentry and joinery and four classes in cabinet making in the evening trade schools at the time of the survey. In three of the classes visited the students were working on problems in stair building and framing. In other classes the pupils were engaged in building furniture or making small pieces of cabinet work to take home. The membership of one class was made up almost entirely of carpenters, but in the other classes a small per cent. of the pupils were engaged in carpentry work.

At the time of the survey there were 176 enrolled in the classes in carpentry and joinery and cabinet making. The occupations of these men and the number enrolled in each school are given below:

Murray Hill Evening Trade School: There were two classes in carpentry and joinery in this school at the time of the survey. In December, twenty-nine men in attendance in these classes filled out questionnaires giving their occupations as follows:

Carpenters	16
Porters	2
Clerks	2
Box maker	1
Mill hand.....	1
Bench work.....	1
Picture framer.....	1
Draftsman	1
Waiter	1
Milkman	1
Assistant superintendent.....	1
Leather worker.....	1

Harlem Evening Trade School: The men in attendance in the class in carpentry and cabinet making in this school gave their occupations as follows:

Carpenters	4
Waiter	1
Upholsterer	1
Elevator operator.....	1
Piano manufacturer.....	1
Furniture Worker.....	1
Porter	1
Telephone worker.....	1
Printer	1

12

Brooklyn Evening Trade School: Two courses in woodworking were offered in this school, one for cabinet makers and one for carpenters. The pupils in attendance in these classes gave their occupations as follows:

CABINET MAKING CLASS		CARPENTRY CLASS	
Wood workers.....	5	Carpenters	10
Carpenters	3	Laborer	1
Cabinet makers.....	3		
Clerks	2		11
Machinists	2		
Tool maker.....	1		
Shipwright	1		

17

Long Island Evening High and Trade School: There were fifteen men in attendance in the class in cabinet making at the time of the survey in January. They gave their occupations as follows:

Shop teachers.....	4
Cabinet makers.....	3
Carpenters	2
Machinists	1
Piano makers.....	1
Clerk	1
Pattern maker.....	1
Auto mechanic.....	1
Draftsman	1

15

Stuyvesant Evening Trade School: There were two classes in cabinet making and one class in carpentry and joinery in this



CLASS IN CABINET MAKING—STUYVESANT EVENING TRADE SCHOOL

school. There were twenty-two men in attendance in the carpentry and joinery classes and twenty-five men enrolled in the two classes in cabinet making. They gave their occupations as follows:

CABINET MAKING CLASSES		CARPENTRY AND JOINERY CLASS	
Woodworkers	9	Carpenters	9
Boat builders	3	Porters	5
Cabinet makers	3	Piano makers	3
Carpenters	2	Cabinet makers	2
Piano makers	2	Clerk	1
Printers	1	Upholsterer	1
Ladies' wear	1	Mechanic	1
Salesman	1		
Upholsterer	1		22
Clerk	1		
Basket maker	1		

25

Bushwick Evening Trade School: There was one class in carpentry and joinery and one class in cabinet making in this school at the time of the survey in February. The occupations of the men in attendance in these classes were as follows:

CABINET MAKING		CARPENTRY AND JOINERY	
Clerks	3	Carpenters	4
Cabinet makers	3	Electrician	1
Machinists	2	Pipe maker	1
Printers	2	Tinsmith	1
Shipwright	1	Photo engraver	1
Baby carriage manufacturer ..	1	Salesman	1
Bookbinder	1	Houseman	1
Telephone repairman	1	Fireman	1
Blue Printer	1	Pen manufacturer	1
Insurance	1	Lithographer	1

21

13

Tottenville Evening Trade School: There was one class in trade carpentry in this school. The occupations of the men in this class were given as follows:

Ship carpenters	4
Copper workers	2
Furniture worker	1
Florist	1
Export business	1
No occupation	2

11

COURSES MAINTAINED UNDER PRIVATE AUSPICES

Pratt Institute conducts a two-year evening course in carpentry and building designed to afford practical instruction for foremen, journeymen and apprentices. The class meets on three evenings a week for a season of six months. A certificate is awarded to those who complete satisfactorily the entire two-season course. The class enrollment during the past year was 37.

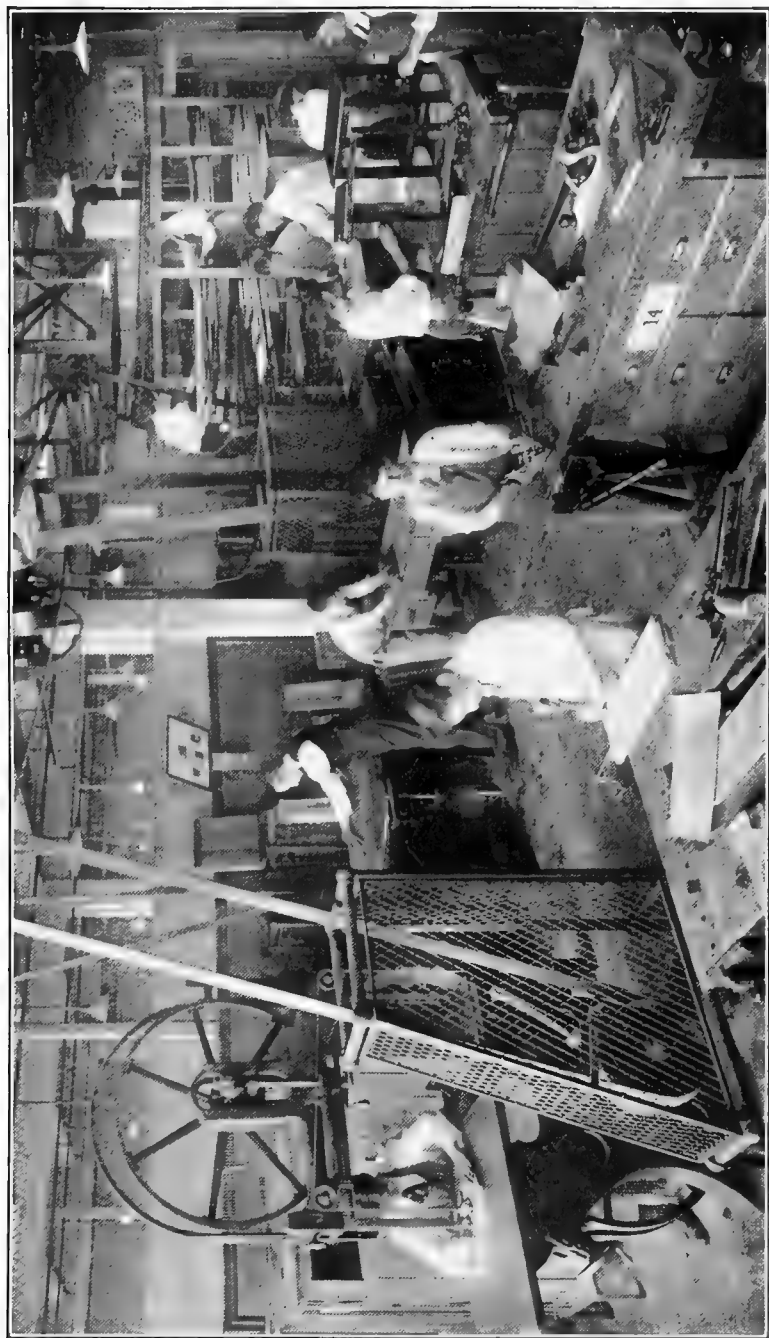
The day class in carpentry at Pratt Institute which was in operation for many years was discontinued at the end of the school year 1916, on account of the limited number of young men applying.

The Baron de Hirsch Trade School provides courses in nine trades, including a course in woodworking. Each course requires five and one-half months for its completion, or 820 working hours. Of this number 730 hours are devoted to practical shop work, with the remaining 90 hours to correlated work in mechanical drawing and shop arithmetic. Two classes are admitted each year.

Instruction is confined to day classes. There are seven pupils in the present carpentry class.

This school has also experienced a very small demand for woodworking, the number in the class averaging ten or less for a number of years.

The New York Trade School maintained day trade classes in carpentry for many years but gave them up at the end of the school year, 1915-16, on account of the small numbers applying.



WOODWORKING DEPARTMENT—BROOKLYN VOCATIONAL SCHOOL

RECOMMENDATIONS OF TRADE COMMITTEES

When the findings of the survey were completed they were submitted to the conference committees appointed by the Master Carpenters' Association and the United Brotherhood of Carpenters and Joiners, and the following resolutions were adopted by the committees:

1. This committee recommends that the Board of Education establish one or more schools for the building trades and consolidate in these schools the equipment now used for carpentry and joinery work in the three day vocational schools for boys. The committee suggests that it might be possible to offer courses in these schools in the following building trades:

1. Carpentry and Joinery
2. Plumbing
3. Sheet metal work
4. Electrical work
5. Marble and tile work
6. Brick laying
7. Stone cutting
8. Painting, decorating and paper hanging
9. Ornamental iron and bronze work
10. Steam and hot water fitting.

2. That the Board of Education continue the two-year day vocational courses in carpentry and joinery for boys 14 to 16 years of age who desire to enter the trade. The committee, appointed by Master Carpenters' Association, assured the director of the survey that under normal trade conditions the members of the association would employ the graduates of these courses.

3. The committee heartily recommends the establishment of evening trade extension courses for the men employed in the carpentry and joinery trade. The following courses were suggested:

1. Courses in lines, levels and measurements for foremen, superintendents and journeymen carpenters. This course to include the use of tapes, levels, plumb bobs, the steel square and transit.

2. Elementary trade drawing
3. Advanced trade drawing for carpenters
4. Short course in freehand sketching
5. Short course in the Building Code requirements.
6. Course in properties and strength of materials
7. Course in mill work
8. Practical course in framing
9. Practical course in stair construction
10. Course in elementary cabinet work
11. Course in advanced cabinet work
12. Course in plan reading and estimating
13. Courses in period design for detailers, shop foremen and superintendents.

4. The committees recommend that an advisory committee of nine members be appointed to assist the Board of Education in developing the courses in carpentry and joinery. That such committee be made up of four members representing employers' associations, four members representing employees' associations and one other member. That the recommendations of this committee to be considered in the following:

1. Equipment
2. Courses of study
3. Length of courses
4. Requirements for teachers
5. Number of pupils admitted to day classes.

5. The committees recommend that a registration fee of \$2.00 be required of all pupils who attend the evening classes in carpentry and joinery. That such fee be returned if the pupil satisfactorily completes 75% of the course.

REPORT OF ADVISORY COMMITTEE

In the report of the advisory committee on day vocational schools the following paragraphs concerning instruction for the carpentry trade appear:

"With the conditions existing in the carpentry trade, it is evident that there is not the opportunity for young workers of 16 or 17 years of age to enter the trade with the chance for advancement to high grade work that is present in the case of printing and machine work. Such openings are limited to the mills and shops dealing with high grade work and to the comparatively few opportunities presented for after advancement to foremen and other supervisory positions in both inside and outside work. These opportunities, however, seem sufficient to warrant the maintenance of pre-employment classes of limited size in this trade.

"The committee feels that instruction in carpentry and electrical work could most effectively be maintained in a central school for the building trades along with other courses in this field. While one such school would, at first, be all that is necessary, other schools could be added as the need became apparent until each borough is provided.

"A specialized central school backed by the interests of the trade dealing in part-time and trade extension classes and standing before the community as the headquarters of the trade, will present a situation much more likely to attract a group of pre-employment pupils who have already formed their desire to be trained for that particular trade than schools in which this trade course appears only as element among other courses.

"The contact of pre-employment pupils in such a central school with the higher processes of the trade and with the workers in the trade will exercise a strong influence in retaining their attendance for the full course of pre-employment instruction."

In the report of the advisory committee on evening schools appears the following:

"This committee heartily endorses the recommendations of the committees appointed by the Allied Printing Trades Council and the Association of Employing Printers, for the establishment

of a centralized school of printing and also the adoption of the courses of study suggested by these committees for evening trade extension classes in printing. This committee also has the firm conviction that it is advisable to bring together in one school wherever practicable, all evening classes in the same field of work in order that through this larger grouping pupils may be more readily and carefully graded as to their previous training, experience and ability. This plan will tend to improve the character of instruction and make possible much better and more far reaching results than are at present obtainable. This arrangement also makes possible a larger and more satisfactory equipment than can be had under the present plan of widely distributed classes in the same subjects."

PART IV

THE MACHINIST TRADE

HISTORICAL SKETCH

Machinery building is the greatest manufacturing industry in the United States. Our present day civilization with its comfort and leisure rests upon the continued building and upkeep of the machinery of production. Both in the number of workers employed and in the "value added by manufacture" the industries embracing the trade of machinist outrank all others. Included in it are the making of implements for producing our food, the means of transportation in all its varied forms—automobiles, railroad trains, ships—the machinery for the production of power, mining equipment in all its variety, the machinery for making clothing, shoes and all other articles of wearing apparel, huge machines for fabricating our buildings and bridges and, in fact, the mechanical means for putting into useable form all the great resources of the natural world.

Obviously, the art of machinery building began with the invention and development of machinery for manufacture which is usually placed between the years 1750 and 1800—the half century which produced the spinning machine, power loom and steam engine. To build these machines it was necessary to have other machines—those that we today call machine tools—and in briefly sketching the invention and development of machine tools we can survey the development of the machinist's trade.

There are four basic machine tools and an almost innumerable number of adaptations of them. These four are the lathe, drilling machine, planer and miller.

The lathe in a crude form for working wood was well known

and widely used long before the building of manufacturing machinery. But the essential principle upon which all metal turning lathes are now constructed is credited to an Englishman, Henry Maudslay, and the date of his invention is placed at about 1797. At that time he brought out the slide rest for his screw-cutting lathe—the invention which is usually ranked as second only to the steam engine in its effect upon the trend of civilization. From that beginning the lathe has had a development along lines that have given us at one extreme the small, accurate bench lathe used for making the parts of watches and similar precision work, and at the other the huge machines used for turning the shafts of steam engines and turbines and for making the tubes and sleeves of 16-inch guns. Another line of development has given us the hand and automatic turret lathes for repetition work, and the hand and automatic screw machines for making small parts in quantities of thousands or even millions.

The drilling machine, like the lathe, also existed in a crude form even in the hands of savages. Its development into the modern machine tool cannot be traced as accurately as for the lathe, but in its present form it ranges from the small, sensitive bench machine used for drilling holes only a very few thousandths of an inch in diameter, up to huge radial machines for drilling locomotive frames and casings of steam turbines. Other developments have given us special drilling machines of many kinds—such as are found in automobile building shops—and even machines for automatic drilling.

The metal planer goes back to the beginning of that period which has given us manufacturing machinery. One of the best known early examples was made by a French mechanic, Nicholas Forq, who in 1751 produced a machine for planing the pump barrels for the pumps used to supply water to the numerous and exceedingly beautiful fountains at the palace of Versailles. From such a beginning we have today the small hand planers for

special tool work, and huge machines for finishing our largest cast-iron and steel castings with openings between the housings 12 feet square or even larger.

Unlike the other fundamental machine tools the milling machine is an American development. The invention of the plain miller is credited to Eli Whitney—of cotton gin fame—in a shop in New Haven, Connecticut, where he was producing muskets for the United States government. The year was 1818. The universal machine did not come until forty-four years later, when Joseph R. Brown of the Brown & Sharpe Manufacturing Company produced a machine in 1862 for milling the flutes in twist drills. Like the other machines, the miller has had a wonderful development, especially for particular operations as hobbing gears, milling gears, milling threads and for automatic and continuous milling.

It is impossible to cover in a small space all of the various types of machine tools which have been produced to meet the ever increasing demands of machinery builders. But one other machine must be referred to—the grinder. This was originally built for precision work only, mainly for making tools. Later its possibility as a manufacturing machine was realized and it is now the backbone of the machinery for finishing precision metal parts. Mr. Henry M. Leland, president of the Cadillac Motor Company, is authority for the statement that the modern automobile could never have been built had it not been for the precision grinding machine tool.

This brief outline of the development of machine tools gives us a hint as to the corresponding and parallel development of the machinists' trade. At first the machinist was largely a hand worker, who chipped, filed and scraped to produce the surfaces on machine parts. Later he became the skilled mechanic who operated the earlier types of machine tools and possessed a widespread knowledge permitting him to do any kind of work in an accurate and expeditious manner. Still later, and now coming down to the period embracing the last twenty years, the specialization of machine tools and the inability to obtain a sufficient number of skilled machinists brought about the development of the machine operator—that is, one who with a very limited degree of skill and experience can handle one machine tool successfully.

The pressure of war has hastened this changing process and today thousands and thousands of women are entering our machine shops to do even precision work in the manufacture of war materials. Had it not been for the intensive development and specialization of machine tools, the efforts of these women and of thousands of unskilled men who are beside them could never have been utilized.

With the coming of the machine operator came the need for refined cutting tools and small tools—jigs, fixtures, gauges—and especially skillful men became tool makers, usually the highest paid men in the shop. So today in the machinists' trade we find tool-makers, all round machinists and machine operators. The degrees of skill are so wide that there is a place for almost every one who wishes to work at machinery building.

LOCAL LANDMARKS.

New York has never been a large machine production center. With the invention of the steamboat, marine engine building was centered in New York, but by the time large vessels became commercial possibilities England had come to be the great ship-builder and the subsequent large development of shipbuilding in this country took place at seaboard points other than New York, and on the Great Lakes. Such well-known marine concerns as Quintard, Fletcher, Delamater and Allaire, however, developed early to meet the demands of the industry. It was at the Delamater Iron Works that Ericsson's Monitor was built and during the Civil War other vessels of the same type were turned out at this plant, the working force then running as high as 2,500 men. The works were located on the North River at the foot of Thirteenth street, the site today being covered with thirty feet of water at low tide. The Delamater Works is also to be credited with building the first successful submarine.

Makers of printing presses have been long represented in New York by the well-known Hoe plant. As to makers of machine tools, New York can own to only one sizable machine tool builder of long standing, the Garvin Machine Co., which sold its first machine in 1865 to the Singer Mfg. Co., then in Mott street.

With the rapid growth of railroad building with its great

demand for mechanical equipment, numerous machinery and metal-working companies were started along the harbor front in 1870 or thereabouts. Many shops were established in the Manhattan district centering around Broome and Centre streets, along the lower East River. But even forty years ago land values and crowding markets compelled Mays & Bliss, the predecessor of the E. W. Bliss Co., to abandon a plan to build on Broome street and to choose its Brooklyn site instead.

While not favorable soil for an industry requiring large floor space and storage room, Manhattan Island was, nevertheless, the birthplace of some companies now large and famous in their line. Here were the early struggles of the predecessor companies of the Ingersoll-Rand Co., well-known maker of pneumatic tools; the Watson-Stillman Co., designer and producer of many types of hydraulic machinery, and others. There still exist on the island many shops in lofts, but the construction of bridges opening up the undeveloped areas of Long Island City and Queens, has been followed by the upbuilding in these localities of communities of machine shops which go far to serve the automobile and repair needs of the metropolis.

Of the machine shops established long ago that have survived, Brooklyn has afforded a far more permanent haven than Manhattan and notable age and distinction have been attained by such as the E. W. Bliss Co., maker of stamping presses, etc.; the Lidgerwood Mfg. Co., hoisting equipment; J. H. William & Co., drop forgings and small tools, and Henry R. Worthington, pioneer pump manufacturer.

At the present time, war and its enormous demand for manufactures is compelling plant extension wherever factory sites permit. This pressure is causing a rapid growth in airplane and other war specialty works in Queens and Brooklyn and dotting the shore-line with new shipyards. Manhattan's loft shops are during the emergency engaged to their capacity on the production of gauges, jigs, dies and small tools urgently in demand by the great munition works of the country. Meanwhile much of the engineering designing and executive skill of the nation is concentrated on lower Manhattan, making it one of the greatest machinery markets of the world.

IMPORTANCE OF THE TRADE

The 1910 Census of the United States, under the heading of "Manufacturing and Mechanical Industries," gives 25,159 as the number of "machinists, millwrights and toolmakers" in the City of New York, of which number 450 are designated as "tool-makers, die setters and sinkers." It further shows that the largest number of workers in any one trade is in the garment industries, and the second largest number in the building trades. In this latter group the number of "carpenters" is given as 41,442, of "painters and glaziers" as 32,065, and of "plumbers and gas and steam fitters" as 19,564. "Electricians and electrical engineers" number 15,512 and the printing industries include 16,826 compositors, linotypers and typesetters," and 2,668 "pressmen."

These figures show that as far as numbers employed are concerned the machinist trade ranks with the first half dozen industries in the city.

It is interesting to note that both the State and City of New York lead all other states and cities in the number of machinists employed. The following tables compiled from the census report of 1910 show the figures for states employing over 15,000 machinists and for cities employing over 5,400 machinists.

NUMBER OF MACHINISTS, MILLWRIGHTS AND TOOLMAKERS

<i>State</i>		<i>City</i>	
New York	66,360	New York	25,159
Pennsylvania	63,360	Chicago	23,422
Ohio	43,955	Philadelphia	19,771
Massachusetts	39,723	Detroit	11,798
Illinois	38,880	Cleveland	11,558
Michigan	30,005	Buffalo	6,856
New Jersey	23,724	Milwaukee	6,524
Indiana	17,540	Boston	6,175
Connecticut	16,880	Pittsburgh	5,429
Wisconsin	15,472		

In spite of the very large numbers of machinists in New York indicated in the above table, the city is not a machine manufacturing center, but is on the other hand a great repair district in which a vast amount of work is constantly being done in the repair of marine engines, street car, subway and elevated equipment, elevators, motor vehicles and central power plants and also upon the upkeep of the great numbers of machines used in the industries of the city such as the printing and clothing trades.

NUMBERS ENGAGED IN TRADE

From the data gathered by the survey, it would appear that there are now approximately 1,000 machine shops in New York City, employing 31,000 general machinists, tool and die makers, specialists, helpers and apprentices. According to the best available information these workers are distributed as follows:

General Machinists	12,000
Tool, Jig and Die Makers.....	1,300
Helpers and Specialists	16,425
Apprentices	1,275
	31,000

There are 9,373 members in the local unions and 384 registered apprentices. On this basis of distribution of machinists' helpers, specialists and apprentices there are 41 apprentices to each 1,000 machinists, specialists and helpers.

NATIONALITY OF THE WORKERS

The last published U. S. Census Report shows that the workers are almost evenly divided between foreign and native born, and that of the native born a little less than half are of foreign and mixed parentage.

HOW MACHINISTS ARE TRAINED

A study of the records of several hundred men shows that approximately 35 per cent. received their training outside of the city. In the marine shops a large number of the workers were trained in Ireland and Scotland, and in the other lines many of the men received their training in Germany and Sweden.

Many of the men in the shops pick up their knowledge of the trade in a more or less haphazard way. Most shops will afford the brighter and more ambitious helper an opportunity to work on the machines, and by shifting from shop to shop such a worker acquires a knowledge of different tools. Again, the worker on one tool may attend an evening school in machine shop practice and so add to his trade knowledge.

Of definite training of apprentices there is little, and what there is, is largely confined to the large establishments. The survey revealed only four establishments having regular indentured apprentices. In eleven other large establishments visited, employing 4,477 machinists and machinists' helpers, there were only 164 apprentices or boys who were being more or less thoroughly trained in the trade.

The apprenticeship agreement entered into between the firms and the apprentice is a printed form signed by the contracting parties, which include parents or guardians acting for minors. The boy must be at least 16 years of age, physically sound, of good moral character and have received a fair education. The educational requirement is stated definitely by one firm as at least four years' schooling, and another firm requires graduation from the public schools, which requirement may be waived in special cases.

The period of apprenticeship is in each case four years, with a probationary period of eight weeks in one case, and twelve in another. The rate of pay varied in each of the four forms of agreement as follows:

	<i>Per hour</i>			<i>Per week</i>
First six months.....	7c.	8c.	7c.	\$4.00
Second six months.....	8c.	10c.	7c.	4.00
Second year	13c.	12-14c.	10c.	5.00
Third year	18c.	16-18c.	13c.	7.00
Fourth year	22c.	20-22c.	16c.	9.00

One firm gives the apprentice who completes his four years \$200 as a bonus, and another gives a bonus of \$100. Still another firm deducts 25 cents per week from the boy's wage and returns it to him in a lump sum when he has served his time, together with 25 cents for each week in which he has lost no time. The purpose of the above plans is, of course, to develop a further incentive for the boy to serve his full time.

One company specifies in its agreement the kind of work it will give the apprentice, as follows:

First	six months:	Weighing material and general helping
Second	" "	Work on centering machine, facing nuts, cutting-off, drilling and work of similar character
Third	" "	Small lathe
Fourth	" "	Shaper and small planer
Fifth	" "	Lathe
Sixth	" "	Connecting rod work, bench and vise work
Seventh	" "	On whatever machine tool the foreman may designate
Eighth	" "	In the erecting shop

Another company promises broadly to "instruct apprentices in the machinist's art and trade in its shops during the term of apprenticeship."

Yet another company is a little more specific in promising "to give thorough instruction on lathe, boring mills, milling machine, planer, vise, assembling and erecting."

One company conducts an evening school for its apprentices, giving instruction in English, workshop mathematics, mechanical drafting and applied mechanics. The apprentice attends the school either two or three evenings a week during the winter for the four years of his apprenticeship.

Another company specifies in its agreement that "all apprentices are required to attend the school course four hours a week for thirty-nine weeks per year." The instruction is given on Saturday afternoons to four groups, each group dividing its time into two hours of mechanical drafting, one hour of mathematics and one hour of shop instruction.

One large machine shop that has no signed agreement with its apprentices required that they attend the public night schools. The same firm has five apprentices employed on the co-operative plan outlined elsewhere in this report.

The Brooklyn Navy Yard has an excellent course for the training of machinists. This is a civilian branch of the work at the yard, but the men trained there are apt to continue in government service and so affect but little the commercial side of the trade.

REGULARITY OF EMPLOYMENT

The war has brought about an unprecedented and abnormal state in the machinists' trade. The engines of warfare, both on land and sea are almost wholly the product of this trade and the enormous demand for delivery of huge quantities of weapons, munitions, etc., with least possible delay, has glutted the demand market far beyond the supply. This demand has resulted in the ready employment of anyone having the slightest knowledge of operating a machine tool. The unions report that in normal times about 20% of the workers in this trade may be unemployed. There are, in general, no marked dull seasons in the trade, employment being quite regular throughout the year.

The machinists employed in marine repair work are mostly engaged upon work on the vessels themselves, and are laid off upon the completion of a job and re-engaged when another develops.

SCALE OF WAGES

Union.—The district lodge establishes the minimum rate of wages in its locality. The minimum and maximum rates prevailing in New York City of June 30, 1917, are as follows:

Machinists:	Per day
Marine shops	\$4.00-\$5.60
General manufacturing	4.00- 5.20
Automobile repairing	4.50 and up
General repair shops.....	4.50- 5.20
Toolmakers	5.20 and up
Erectors	6.00- 7.00
Specialists	1.75- 4.00
Helpers	2.50- 3.50
Apprentices	1.00 and up

In marine work the men receive double pay for the first four hours of overtime and triple pay for each additional four hours of overtime.

In manufacturing shops the rate for overtime work is one and one-half of regular pay for first three hours and double pay after that.

Erectors receive double pay for overtime work.

The terms machinist, specialist, helper and apprentice, are defined by the union in its constitution, as follows:—

Machinists include persons who can, with the aid of tools, with or without drawings, make, repair, erect, assemble or dismantle machinery, or parts thereof.

Specialists include persons who are employed at some branch or subdivision or who perform some line or class of work commonly recognized as work connected with the machinist trade or metal industry, and requiring but a portion of the skill that is usually exacted from a machinist.

Helpers are not clearly defined in the Constitution of the Machinist Helpers' Organization, but their status may be implied from the requirement for admission to the Lodge which reads as follows:—

"Any man who has had one month's experience as a machinist's helper and competent to command the minimum rate of wages paid in his locality, and who is not eligible to membership as a specialist."

Helpers include persons who fetch tools preliminary to starting a job and return them to their proper places when finished;

who assist in lifting and moving parts of a job; clean work; paint parts; remove turnings, and otherwise assist the machinists.

Apprentice:—Any boy engaging himself for four years to learn the trade of machinist. He may not begin his apprenticeship until he is sixteen years old, nor after he is twenty-one years of age.

Non-Union:—The maximum non-union wages correspond with the union rates.

TYPES OF MACHINE SHOPS

There are two broad divisions into which the machine shops of the city may be grouped; the manufacturing shop and the repair shop. There are some shops doing both manufacturing and repair work, but in general, the division holds.

The manufacturing shop may be divided into the following groups:

The manufacture of heavy machinery, such as engines, pumps, hoisting machinery, refrigerating machinery, grinding and mixing machines, and large printing presses.

The manufacture of special machinery, such as the linotype, printing machinery, bottling machines, stabilizing machinery, water meters, typewriters, weighing and packing machines, cigar and cigarette machines, carpentry machinery, machine shop tools, dies, jigs and fixtures.

Automobile construction.

Marine construction.

The repair shop as a distinctive group is generally limited to repairs upon a particular kind of machine or work, as an elevator repair shop, marine repair shop, automobile repair shop, or railway repair shop. Small independent machine shops are often spoken of as repair shops, but many of them are also engaged in construction work.

For the purposes of this survey, the following grouping of types of shops is made:

No. 1. Construction Shops:—

- a. Heavy machinery
- b. Special machinery
- c. Automobile
- d. Marine
- e. General

No. 2. Repair Shops:—

- a. Railway
- b. Marine
- c. Automobile
- d. Elevator
- e. Special machines
- f. General

Group No. 1-a. There are but few shops of this class in the city. These shops are equipped with huge machine tools for machining large castings and forgings, and powerful traveling cranes for handling heavy parts. This is the old line type of large machine shop and little or no attempt is made at specializing. One firm in this group whose product is limited to oil engines and refrigerating machinery employs 300 machinists, 200 helpers and 50 apprentices, and another specializing in hoisting machinery employs 290 machinists, 90 helpers and 7 apprentices.

Group No. 1-b. The distinctive feature of this group is the manufacture of machines to perform some special function, as the setting of type, the sealing of bottles, the weighing and packing of commodities, the making of cigarettes, printing, etc., and also the making of tools, dies, etc. This group includes the larger part of the constructive machine work done in the city. The largest single unit in this group is the making of printing presses, one firm alone employing 910 machinists, 169 helpers and 55 apprentices.

This type of shop shows the recent development of the machinists' industry and the tendency of the modern shop to specialize not only its product but also in its help.

In one shop the machinery is organized in departments and the general machinists almost entirely eliminated. A standard article is manufactured and all work is expected to be interchangeable; that is, of the hundred pieces manufactured, all must be of exact size so as to fit any machine to which they may be adjusted. Here the toolmaker is the keynote to the plant.

Jigs and fixtures are designed and manufactured in the tool room. The machine tools are shaped and kept sharp, and the particular machine set up for its various operations by the floor or gang boss. The specialist is merely a machine tender.

In another shop it was found that while the work was highly specialized and interchangeable parts were made, a high order of skill was required to perform the necessary machine operations.

Lathe hands, planer hands, milling machine hands, etc., were grouped in departments, but each had to understand the fundamentals of the trade and be particularly proficient in skill and technical knowledge relating to the machine he operated.

In the ten shops of the general manufacturing type surveyed, there were 7,836 employees working at all branches of the machine industry.

In one shop the employer found it profitable to hire and systematize the training of apprentices; in another the employer said his shop was gradually getting away from hiring boys who were less than 18 years of age.

Group No. 1-c. There is relatively little automobile manufacturing done in the city. There is one firm manufacturing an expensive, high grade car and two firms making automobile trucks. Several of the well-known manufacturers of cars have assembling plants within the city. In the case of the low-priced car these plants employ mechanics for the assembling of parts, as such work does not require a skilled machinist.

Group No. 1-d. With the exception of the Brooklyn Navy Yard, little marine construction work is carried on in this city during normal times. There is promise of a considerable extension in this line in the near future.

Group No. 1-e. There are shops in the city which do considerable miscellaneous construction work. One such shop visited in this survey employs 75 machinists. At the time of the visit the shop was constructing 50 machine tools of one type on a single order. At other times similar bulk orders are filled, but the shop differs from those of Group No. 1-b in that the work is not confined to the making of one special line of machines. Much of the work of a shop of this kind is the construction of models for inventors and the making of special tools, dies, jigs, etc.

Group No. 2-a. The railway work of the machinist is all repair work. The machinists' part of the work of repairs on the subway, elevated and surface cars of the city is largely confined to the trucks. The truck bearing the motor is termed the motor truck and the other the trailer. On both trucks there is considerable repair work to be done on the axle and wheels. The axle and the wheel castings are received at the shop in a condition requiring finishing. The axle is turned down to proper dimensions and the wheel is finished to receive the axle. The two are fastened together by forced fitting. This requires a hydraulic wheel press, which is a special tool for the purpose and found only in shops

of this type. The faces of wheels require turning down, which is done on special wheel lathes. The rest of the work on the trucks is putting on new brakes shoes, and general overhauling. As the trucks are put together with bolts and nuts, the principal tools employed are wrenches, hammers and bars.

The repairs on the motors are mainly electrical work, though machine tools are used in some instances, as in turning down the face of commutators.

Considerable air-brake repairing and overhauling is done at the 148th Street shops of the Interborough Railroad Co. This is bench work and is largely confined to hand tools.

Cars are periodically overhauled, therefore employment is regular.

Group No. 2-b. There are two groups of marine repair machinists; inside or shop men and outside men.

The inside man is required to be a general hand, that is, if the job requires lathe work, planer operation work, or work on other tools, he must perform all those operations and fit and file when required. He must have also a knowledge of shrink fits and press fits, and possess a general skill not required of a mechanic. Sometimes, in small shops, he will be required to do outside work. His job is fairly regular because machine work is generally on hand in the shop to tide him over slack periods. This type of machinist will, including overtime, earn wages reaching to \$70 weekly.

Outside men are usually migratory workers. When a ship is docked and about to be repaired they line up before the shop door. The foremen pick the men for each gang and they are sent aboard the ship. The work is stripped and sent to the shop, except wheel propellers which are usually rebored and slotted on the dock.

Such workers make up all pipe joints, drill flanges, take out broken studs, fit manhole covers, insert gaskets, install deck parts, boat davits, port lights, wireless rigs, gearing and shafting for mechanical operation of ventilators, steering gear, and checks on boilers, overhaul main, tail and auxiliary shafting, the deck auxiliary anchor engines, emergency pumps, and in fact deal with all mechanical contrivances about the ship.

These outside men usually stay aboard ship, working day and night until the job is completed and then move to another job.

Group No. 2-c. While there are numerous so-called automobile repair shops throughout the city, there are but few of such shops

that employ a highly skilled machinist or have even the usual machine shop equipment. The repairing done in such shops usually consists in dismantling a part or parts of the car, cleaning and putting together. Very few service garages have a machine shop attached. The Automobile Club of America has a well-equipped shop employing a dozen machinists. One of the large service garages visited in the survey had a machine shop with five machinists, while another well-known service garage of about equal size had neither shop nor machinist.

Group No. 2-d. There is constant call for repair work on elevators necessitating the retention of a considerable group of machinists for this special work. In the repair shop of one large elevator building concern there are employed 35 machinists, 75 helpers and 3 apprentices.

Group No. 2-e. This is an important group and includes a large proportion of the men engaged in repair work. Every large manufacturing concern employing machines requires the services of one or more machinists to keep the machines in repair. The manufacturer of typewriters and computing machines maintain repair shops employing the service of a large number of machinists. Newspaper and other large printing establishments employ machinists as a part of their permanent staff. Establishments using a large number of sewing machines require the services of machinists. The list might be extended throughout the many industries employing power-driven machinery.

Group No. 2-f. This type of shop handles all classes and kinds of repairs, and usually employs from one to five machinists.

The equipment may consist of two or three lathes of an antiquated type ranging in size from 12" to 36" swing. In addition, there is generally a speed lathe, a spindle or radial drill press and a shaper. Sometimes such a shop will have a planer. There will also be a store of countless bolts, nuts, clamps, and blocks, with boring bars, and bushings for special jobs lying about the shop in bins. Much of the work of such establishments is done outside the shop, such as the reboring of cylinder valve parts, putting on elevator cables, repairs to laundry machinery and pumps. There are about 50 of these shops in Greater New York.

SPECIALIZATION

The machinists of the city specialize, in general, along the lines indicated in the groupings of the types of shops. Again, there are groups of machinists who specialize in small tool making,

or in die making or die sinking. Another group are assemblers and another are erectors.

The operators or specialists are found in the following subdivisions of the trade and are usually familiar with the operation of but one type of machine:

1. Lathe work
 - a—bench
 - b—engine
 - c—turret
2. Milling machine work
3. Shaper work
4. Planer work
5. Drilling machine work
6. Other special machine work
 - a—horizontal
 - b—vertical
7. Centering machine work
8. Grinding machine work
9. Slotter work
10. Key seating machine work
11. Automatic screw machine work.

TRADE ORGANIZATIONS

Employers' Associations:—The two associations of employers utilizing the services of machinists in New York City and vicinity are: The National Metal Trades Association and the New York and New Jersey Dry Dock Association. The local branch of the former association, officially designated as the New York and New Jersey Branch, comprises 54 corporations and firms. The latter association comprises 20 corporations and firms controlling all of the ship yards in the port of New York.

Employees' Organizations:—The organized machinists of the City of New York and Hudson County, N. J., compose District No. 15 of the International Association of Machinists. The district organization is subdivided into 20 locals. In general the composition of individual locals is based upon trade divisions and not localities. The local subdivision is used in those branches of the trade having a large enrollment, as in marine and railroad work. About 15 per cent of the members avail themselves of a locality affiliation regardless of the division of the branch of the

trade they work in. There are two locals based on nationality; Scandinavian and Hungarian, though a large number of the former nationality are scattered through other locals. The machinists of the Navy Yard Local are not under the direct supervision of District No. 15, but co-operate with it.

The various locals are divided as follows:—

<i>Kind of work</i>	<i>No. of Locals</i>	<i>Membership</i>
Marine	6	2830
Railroad	3	642
Municipal Employees	1	96
Printing Machinery	1	2428
Automobiles	2	960
Erectors	1	226
Special Machinery	1	672
Toolmakers	1	620
Apprentices	1	384
Helpers	1	180
Scandinavian	1	175
Hungarian	1	160
	—	—
Totals	20	9373

ANALYSIS OF THE TRADE

The machinist makes use of various power-driven tools that group according to function. He also makes use of various hand tools that have a wide application.

The operations performed by power-driven machines are turning, planing, drilling, boring, slotting, milling, and grinding. These different operations are performed on special machines. Turning is done upon a lathe, planing upon a planer or shaper, and the other operations upon machines bearing characteristic names.

In the following pages the analysis of the trade is made upon the basis of the work performed on the principal machines, and the knowledge required by the worker to operate a particular machine. The description of the work of each operator is based upon the assumption that he should possess a full knowledge of the machine upon which he works and of proper methods of performing the work. In practice, especially in large shops, the man who actually operates the machine may be quite unskilled as a machinist. All the work of laying out and preparing the material for operation is in many cases performed by a skilled machinist

and the operator's work is limited to merely tending the machine. In the terminology of the unions this man is known as a "specialist."

The specialization demanded by modern methods often tends to limit the work of the individual workman within very narrow boundaries, generally to tending a single machine. Should the workman desire a knowledge of the operation of different machines he may be compelled to seek work in various shops, and so gradually build up a broader experience.

The broadly trained machinist should be able to perform every operation required in transforming the raw material of his trade into the finished product. A large amount of ingenuity is sometimes required in determining the best method of procedure with a particular job and the ordinary workman in the shop is often afforded scant opportunity for acquiring the exacting knowledge which the skilled machinist possesses in this connection. This condition presents an exceptional need for instruction outside the shop both of a practical and theoretical nature.

REQUIREMENTS FOR THE MACHINIST

The skill required of the machine worker is of a different nature from that required of the worker with hand tools. It is mainly a matter of making the requisite adjustments for the machine tool to operate properly when the power is turned on. The requirements, in general, comprise the following: skill in laying out the work; skill in making the various adjustments as to speed and feed with quickness and accuracy; skill in mounting the work securely; skill in setting the cutting tool properly and quickly; skill in advancing the tool to the exact required depth of cut; skill in feeding by hand when necessary; delicate skill of touch in using the calipers and micrometer. In addition, every machinist is required to possess a certain amount of skill with the file, chipping and cape-chisels and scraper, although the highest grade of work in the difficult art of scraping is reserved for the expert.

The machinist should know, first of all, the names and uses of the following tools in common use in a machine shop:—hammers, chisels, screw drivers, steel rule, square, center punch, scriber, dividers, protractor, tramhels, various gauges—surface, depth, center, taper, thread, and drill; various calipers—inside, outside, hermaphrodite, vernier, and bar; pliers, hack-saw, level,

bevel, files, taps, scratch awl, combination set, and micrometers—inside, outside and thread.

He should be familiar with the different adjustments required on the special tool he is to operate. He should understand the proper shape and angles of cutting tools needed for different metals and different conditions of cut and feed and should know how to grind and temper same (although cutting tools are commonly supplied from the tool room ready for operation) and should know when tool needs regrinding.

He should understand factory regulations, regarding safety appliance, sanitation, and rendering aid in case of injury. He should know the requirements as to time cards and tool checking. He should know how to add, subtract, multiply and divide with figures up to 100 and to use simple fractions and decimals. He should be able to read and comprehend the blue prints from which he works and to make simple free-hand shop sketches.

To be equipped for high grade work and opportunities for advancement the machinist should possess, in addition to the above, a knowledge of the following:

He should know the uses and possibilities of all varieties of machine tools and be able to operate them.

He should understand the theory of cutting tools, proper angles of clearance and rake; and the effect of spring in the tool. He should know the relation between cutting speed and the speed of work, both as regards ordinary carbon steel tools and those made of high speed steel; speeds for roughing and finishing cuts; the effect of kind of metal on cutting speed and the factors limiting cutting speeds; the influence of diameters on resistance to cuts; computation of cutting speeds; and the relation between feed and the material being cut. He should understand the various screw thread systems and kinds of threads; also standard tapers.

His knowledge of belts and pulleys should include: rules governing transmission by belts, ropes, and chains, how to determine the lengths of open and crossed belts; velocity ratio of pulleys; speed cones; horse power transmitted by belts; and the care and use of different kinds of belting, including lacing, splicing, and glueing. He should know the proper lubricant to use for each requirement and method of applying and understand the construction of different forms of bearings in use and the advantages and limitations of each.

He should know how to install machinery, including fastening to foundations, leveling, setting up of machines; placing and lining-up of hangers, line and counter shafting; the determination of the size of shafts, belting, etc., and how to arrange machines for efficient routing of material through factory. He should be familiar with those properties of the various metals with which he deals that effect their use or machining.

He should know how to apply his knowledge of arithmetic to determining cutting speeds and feeds; pulley sizes; feed and gear ratios; indexing; thread measurements and computations; and taper computations and should understand the elements of mechanism as involved in crank and connecting rods, ratchets, cams and gears.

His knowledge of geometry should comprise an understanding of the mathematics of the various geometric forms met with in his work; the measurement of angles; and the solution of right triangles.

His knowledge of applied mechanics should include the laws of simple machines, and methods of calculating power. He should also understand the action of heat in expanding and contracting metals, and the elementary principles of hydraulics and pneumatics.

He should know how to make a simple mechanical drawing and shop sketches; and to understand from the reading of a blue-print how to select castings, order stock, determine what operations are necessary, and what jigs required.

In some shops one or more men are regularly employed in what is termed:

Laying out work: This work consists of placing upon the stock material, castings, forgings, or partially finished surfaces such marks or lines as will show the exact location and nature of the operations to be performed as specified in the drawing. Sometimes the worker inspects and tests the finished or partly finished work, though in some shops this is the special function of the *inspector*.

Such a worker should know how to determine whether or not the casting or forging has the required amount of stock; how to use prick punch, hammer, surface scribe, level, square, dividers, trammels, plumb line, surface plate and table, straight edge, and templates, in making the different kinds of lay outs. He should have a thorough knowledge of machine processes.

ASSEMBLER

The component parts of any piece of machinery are made separately and it is the work of the assembler to bring together these parts into the assembled whole. The work is divided into bench work and floor work. Upon the bench a complete small machine or instrument may be put together, or some part of a larger machine. That is, in the manufacture of an automobile, the engine is assembled on a bench and the complete machine is assembled on the floor. The term *erector* is also used to designate one engaged in assembling of large machines, engines, conveying machinery, etc., in permanent installation.

In the assembling of standardized machines made in large quantities the knowledge required is often very small, as the work is extremely specialized, as in the assembling of an automobile, and may require of a worker merely the fastening of a bolt or two. But the assembler's work may range from this minimum to the careful finishing and fitting of the parts as assembled. To fulfill the requirements for the latter work the worker must be a skilled machinist. The assembling of larger machines calls for an additional knowledge of methods of blocking up the work and of handling the parts with the aid of various forms of hoists and cranes.

ERECTORS

Kind of work performed: The worker handles, erects, assembles, dismantles and repairs all kinds and classes of machinery in new and old buildings, and buildings in process of erection, or wherever machinery may be installed, and controls and operates same until accepted by the purchaser. Some of the machinery handled and erected by the worker follows: Newspaper printing presses; steam turbines; corliss engines; refrigerating machinery; hydraulic pumps; electrical machinery; elevating and lowering machinery, by power or gravity; conveying machinery, such as belt and slat conveyors, for dry or wet materials, coal, ash, ore and cement conveyors; weighing machinery; paint and dye machinery, etc.

Such a worker should know how to run lines with surveyor's instruments, and to level, line and square the position of all kinds of engines and other machines. He should know how to locate foundations, set templates, and understand the proper mixture of concrete for foundations.

He should have a knowledge of the strength of ropes and chains, the reaving of blocks, and the proper adjustment of rigging so that no accidents occur in the handling and placing of material which ranges from a few pounds in weight to fifty or more tons per piece. He should be able to meet the various conditions arising in the buildings or other places where work is being installed and where various other trades may be pursuing their work at the same time. Dust and dirt, which are inimical to machinery, must be dealt with and excluded from all moving parts and bearings.

If in charge of a job he should possess executive ability in order to conserve the interests of his employer in relation to the purchaser, and be able to effectively control the men under him. His responsibility is considerable, as not alone must he assemble the installation, but he must often also operate same to the satisfaction of the purchaser. The major part of the knowledge necessary to be an efficient erecting machinist is acquired by actual experience by those possessing the ground work of a general machinist.

TOOLMAKER

A tool may be broadly defined as any device, appliance or machine for transforming raw material into a finished product or that aid in performing some part of this transformation. In machine shop parlance tool making is limited to the production of small general tools, such as taps, dies, reamers, milling cutters, and of special tools, such as jigs and implements used in the production of duplicate work.

Most of these small tools used in a machine shop are purchased from manufacturers who specialize in their production, thereby limiting the work of the tool maker in a shop to the making of special tools differing in size or design from standard or commercial tools and jigs, fixtures, and dies for duplicate production. The making of cutting tools requires expert skill and knowledge. It represents one of the highest developments of the machinists' trade and calls for thorough command of all small machine tools, particularly the milling machine and grinding machine. The making of dies requires a high degree of skill and generally forms a separate division of tool-making, the workers being known as die sinkers and die makers.

BENCH WORKER

Kind of work performed: Bench work, as the term is generally used in a machine shop, comprises chipping, filing, scraping, drilling, tapping, hand-reaming, and soldering, done upon a bench. Benches are provided with a vise into which work is clamped for filing, chipping, tapping, and scraping. Much of the work formerly done on the bench is now done on machines or by power-driven tools, yet no work in the shop demands a greater amount of skill than the higher requirements of bench work.

BENCH LATHE WORKER

A single form of lathe, termed a bench lathe, is often built with short legs to permit its placing upon bench. It is largely employed in instrument making and small turning. Its functions are similar to those of the engine lathe with the limitations entailed by its simpler construction and smaller size.

The detailed knowledge necessary to do the work is similar to that described below for the engine lathe worker.

ENGINE LATHE WORKER

The engine lathe is a power-driven machine used for turning on centers and mandrel, chuck and face-plate work, facing, drilling, boring, reaming, thread-cutting, taper turning, knurling, filing and polishing (See Fig. 1).

In turning plane cylindrical surfaces, the worker should know how to locate centers, using dividers, calipers, center squares, and the various center punches. He should understand the ways of holding work between centers, lubricating centers and the use of lathe dogs. He should be familiar with the care and shapes of centers and how to grind and line them up and keep them true. He should understand the different forces at play when a cutting tool is in action, and the influence of bent-tailed dog in springing the work. He should know the correct methods of driving the work and the proper adjustment to prevent errors; the setting of the tool for rough and finishing cut, squaring ends, taper turning; the use of steady rest and follower rest. He should understand and be able to make a sliding fit, shrink fit, forced fit and driving fit, and be skilled in the use of both ordinary and micrometer calipers, the types, uses, and care of mandrels. He should know the use of files, emery, and polishing stick in turning, the speed required in their use; and the finishing of polished surfaces.

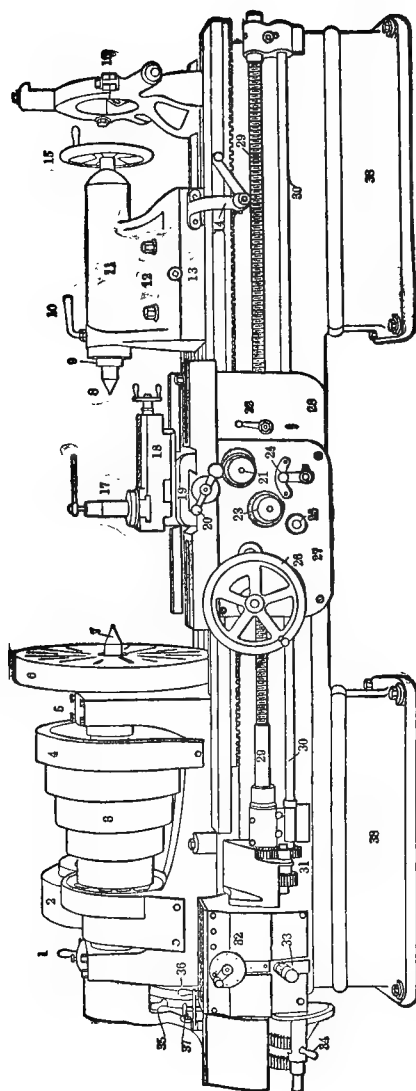


FIG. 1
ENGINE LATHE

1. Rear bearing
2. Back-gear case
3. Cone pulley
4. Face-gear guard
5. Front bearing
6. Face plate
7. Live center
8. Dead center
9. Tail spindle lock
10. Tailstock slide
11. Locking bolts
12. Tailstock base
13. Tailstock base

27. Front apron
28. Rear apron
29. Lead screw
30. Feed rod
31. Feed gears
32. Feed box
33. Change-gear handle
34. Compound gears
35. Change-gear handle
36. Change-gear handle
37. Change-gear handle
38. Bed

In chuck and face plate work he should be familiar with the different kinds of chucks, the advantage of each, and their care; should know how to use face plate and steady rest, the methods of chucking on the face plate by use of bolts, clamps, blocks, parallel strips and angle plates; how to bore holes and ream them, and also measure them with calipers and gauges.

In cutting threads he should know the use and adjustment of change gears, lead screw, carriage and cross feeds; and how to make the necessary calculations; how to cut various threads, both external and internal, by use of threading tools, and taps and dies. He should be acquainted with the names and functions of various types of screw threads, and how to caliper, gauge and fit them.

MILLING MACHINE WORKER

The milling machine (Fig. 2) has for its operating tool a revolving cutter, and a table for holding the work and moving it against the cutter. There are various types of milling machines ranging from a comparatively simple machine for straight milling to the most complicated machine in the shop—the universal milling machine. This latter type has a swiveling table arranged with feeds by which all classes of plane, circular, helical, rack cutting and other milling may be performed. The work performed includes gear and worm cutting, indexing and fluting which is performed on a special fixture or tool called the “dividing head.” There is also provided a slotting attachment and a high speed milling attachment.

In this case the requirement that the worker should know the name, care and use of the component parts of the machine and its attachments means almost a liberal education in machine shop practice. The wide and important field covered by this machine is often limited by a lack of comprehension on the part of the worker. The worker should know the care and use of the bed, table, cone, spindle, back gears, over arm, arbor brace and collets; the various feed adjustments, horizontal, vertical and cross; the various vises single and double screw, plane, swivel and tilting; plane and indexed centers; indexing head; and the special attachments for circular, spiral and cam milling, vertical head slotting, and undercutting oil pump.

He should be skilled in the use of the various cutters employed, plain, side, angular and end milling; axial; form; key seat; and saws. He should know the use of wrenches, clamps, dogs, angle

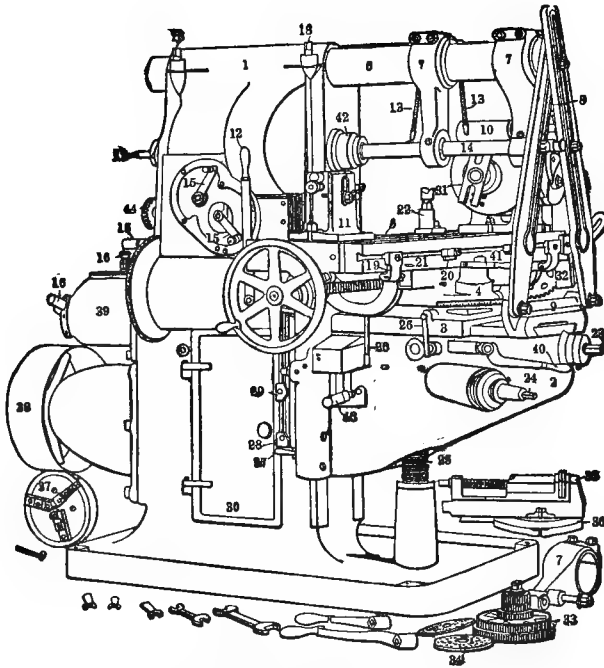


FIG. 2

UNIVERSAL MILLING MACHINE

- | | |
|----------------------------------|--|
| 1. Column | 24. Elevating shaft |
| 2. Knee | 25. Elevating screw (telescopic) |
| 3. Saddle | 26. Saddle-clamp levers |
| 4. Swivel carriage | 27. Knee-clamp levers |
| 5. Work table | 28. Fixed vertical feed trip |
| 6. Over arm | 29. Vertical feed-trip blocks |
| 7. Arm brackets (arbor supports) | 30. Door |
| 8. Arm braces (harness) | 31. Dog driver |
| 9. Knee clamp (for arm braces) | 32. Change-gear bracket |
| 10. Spiral dividing head | 33. Change gears |
| 11. Tailstock | 34. Index plates |
| 12. Starting lever | 35. Vise |
| 13. Oil tubes | 36. Swivel base |
| 14. Cutter arbor | 37. Universal chuck |
| 15. Speed-changing lever | 38. Driving pulley |
| 16. Feed-changing lever | 39. Feed box |
| 17. Draw-in rod for arbor | 40. Cross and vertical feed handle |
| 18. Arm-clamp screws | 41. Table-feed handle |
| 19. Table stops | 42. Clutch-drive collar |
| 20. Table-feed trip block | 43. Interlocking lever to prevent the engagement of more than one feed at a time |
| 21. Fixed table-feed trips | |
| 22. Steady rest | |
| 23. Cross-feed screw | |

plates, jacks and parallel strips in fastening work to the bed or table. He should understand the adjustment of all automatic parts and how to avoid danger in interlocking parts.

PLANER WORKER

The planer (Fig. 3) is used for planing surfaces of metals. The work is clamped upon the platen which runs back and forth under a stationary cutting tool.

Skill is required in properly fastening the work to the platen, and the worker should be familiar with the use of clamps, bolts, blocks, pins, plugs, jacks, V blocks, angle plates, parallel strips, level, and wedges for doing this. He should understand the use of plain, swivel, tilting and magnetic chucks and the proper position on the platen for setting the work; the capacity of the machine, and how to plane a number of pieces at one time. He should know the maximum depths of cuts, and the best adjustment feeds for, to obtain the most economical results in roughing of planers and the name, care and use of the principal parts of the machine.

In slotting, key seating and circular planing, the planer hand should understand the use of dog and other holding devices, when employing centers, with and without index, the operation of index, and method of determining divisions.

SHAPER WORKER

The shaper (Fig. 4) is a machine for planing the surface of metals, rack cutting, slotting, key seating and irregular shaping. Its action is the opposite of that of the planer in that the work is held stationary and the tool is carried by a ram to and fro across the work.

The worker should know the name, care and use of the principal parts of the machine and attachments. He should understand the methods and devices for holding the work on the table and on the saddle, and the methods for setting, resetting, and testing. He should be skilled in the operations of cutting to a shoulder and in irregular shaping.

SLOTTER WORKER

The slotter is a machine for planing straight, circular and irregular surfaces of metals. It has a circular adjustable table

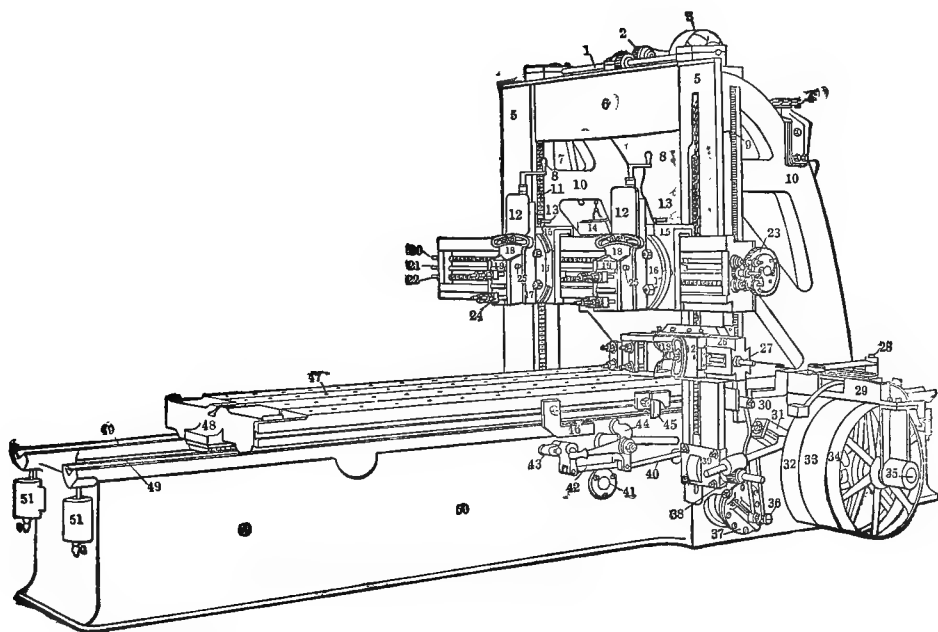


FIG. 3
PLANER

- | | |
|--|---------------------------------------|
| 1. Shaft for raising cross-rail | 24. Tool-holding straps |
| 2. Gears for raising cross-rail | 25. Clapper block pin |
| 3. Pulley drive for raising cross-rail | 26. Side head |
| 4. Chain for counterweighing the cross-rail | 27. Side head for feed screw |
| 5. Face of uprights | 28. Belt shifter |
| 6. Tie piece between uprights | 29. Drive-pulley support |
| 7. Handle controlling | 30. Connection to feed rack |
| 8. Crank handle for raising tool block | 31. Regulator for vertical feed |
| 9. Rack for moving feed screw in cross-rail | 32. Forward driving pulley |
| 10. Upright or housing | 33. Loose pulley |
| 11. Screw for elevating cross-rail | 34. Return driving pulley |
| 12. Tool slide | 35. Driving shaft |
| 13. Screw to clamp saddle to cross-rail | 36. Regulator cross-feed |
| 14. Counter weight for left side of cross-rail | 37. Cross-feed drive |
| 15. Saddle | 38. Vertical feed pinion |
| 16. Swivel | 39. Vertical feed rod |
| 17. Clamping bolt | 40. Rod to belt shifter for reversing |
| 18. Clapper box | 41. Bull or driving-wheel shaft |
| 19. Clapper block | 42. Connections to safety-lock |
| 20. Feed screw for left-hand head | 43. Lock to prevent table being moved |
| 21. Vertical feed rod | 44. Reversing latch or trip |
| 22. Feed screw for right-hand head | 45. Forward stop dog |
| 23. Feed mechanism on end of cross-rail | 46. Backward stop dog |
| | 47. Platen or table |
| | 48. Rack under platen |
| | 49. Ways or V's |
| | 50. Bed |
| | 51. Oil reservoirs |

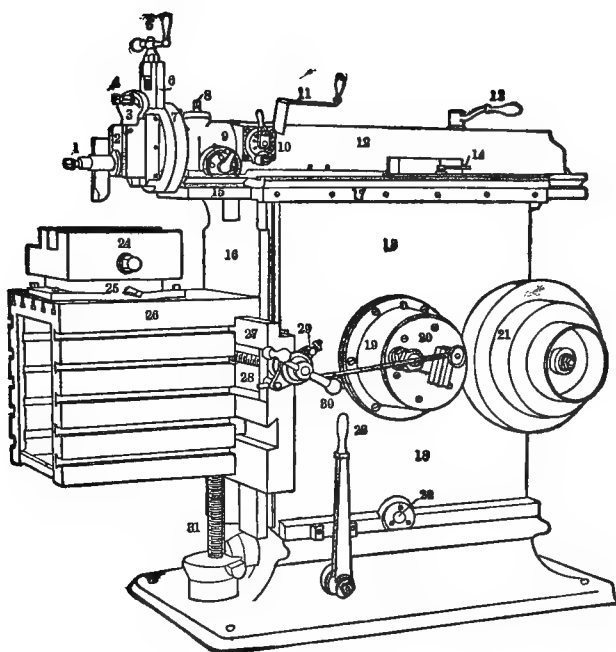


FIG. 4

SHAPER

- | | |
|--------------------------|------------------------------|
| 1. Tool post | 17. Ram guide |
| 2. Clapper block | 18. Frame or body |
| 3. Clapper box | 19. Feed box |
| 4. Clamping bolts | 20. Feed regulator |
| 5. Down-feed screw | 21. Cone-driving pulley |
| 6. Tool slide | 22. Lever bearing |
| 7. Tool head | 23. Power elevation of table |
| 8. Binder for head | 24. Vise |
| 9. Stop for down feed | 25. Swiveling base |
| 10. Down-feed adjustment | 26. Table |
| 11. Ram adjuster | 27. Saddle |
| 12. Ram | 28. Cross-feed screw |
| 13. Position lever | 29. Cross-feed dog |
| 14. Clamp for down feed | 30. Cross-feed handle |
| 15. Ram slide | 31. Elevating screw |
| 16. Face of column | |

upon which the work is fastened, and a cutting tool fastened to a ram which moves vertically.

The worker should understand the various special requirements involved in setting up and securing the work and the cutting tool and should know how to make the various adjustments required for indexing and in cutting irregular curves.

DRILLING MACHINE WORKER

Various kinds of machines are used for drilling, counterdrilling, and countersinking holes in metals. (Fig. 5.)

The worker should know how to secure work rigidly by the use of clamps, bolts, chucks, parallel strips, angle plates and V blocks; how to select the correct size, and kind of drills, and how to use them; how to determine the speed of drills; and how to use taps and jigs. He should possess the skill requisite to perform all kinds of drilling operations with speed and accuracy.

BORING MACHINE WORKER

There are two distinct types of boring machines; the vertical boring machines (Fig. 6) often called a "vertical mill," having a rotating horizontal table upon which the work is fastened, and one or more stationary vertical tools for boring, turning, or facing; the horizontal boring machine (Fig. 7) with horizontal boring bar.

The worker should know how to clamp the work rigidly upon the table; how to select the proper cutting tools, and set them; and how to determine the proper cut, speed and feed.

GRINDING MACHINE WORKER

Kind of work performed: The grinding machine is used for grinding the surfaces of metals by rapidly rotating an abrasive against these surfaces. There are various types of such machines, e.g., the universal grinder (Fig. 8) used for a variety of work mainly circular and machines used solely for the grinding of flat surfaces. The grinding machine worker called upon to perform both rough and fine grinding, either cylindrical, internal or surface grinding, and cutter and tool grinding.

The worker should know how to select abrasive wheels for grinding various kinds of metals; determine the correct speed and feeds required; how to avoid local heating, vibration, and

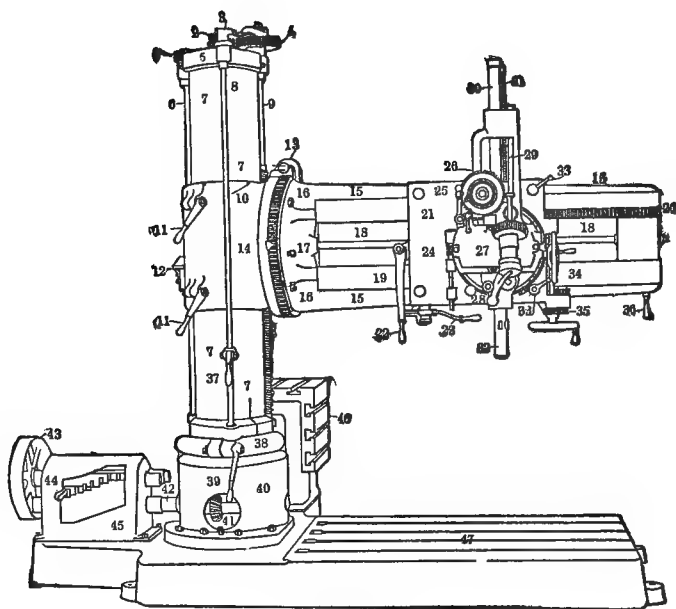


FIG. 5

RADIAL DRILL

- | | |
|--------------------------------------|----------------------------|
| 1. Vertical driving-shaft gear | 24. Head-swivelling worm |
| 2. Center driving-shaft gear | 25. Feed-trip lever |
| 3. Elevating tumbler - plate segment | 26. Index gear |
| 4. Elevating-screw gear | 27. Universal head |
| 5. Column cap | 28. Quick-return lever |
| 6. Vertical driving shaft | 29. Feed-rack worm shaft |
| 7. Column sleeve | 30. Spindle sleeve |
| 8. Elevating-lever shaft | 31. Feed rack |
| 9. Elevating screw | 32. Spindle |
| 10. Arm girdle | 33. Saddle-binding lever |
| 11. Arm-blinder handle | 34. Feed-hand wheel |
| 12. Arm-mitre gear guard | 35. Head-moving gear |
| 13. Arm-worm box | 36. Arm-swivelling handle |
| 14. Arm pointer | 37. Elevating lever |
| 15. Full universal arm | 38. Clamping ring |
| 16. Arm-clamping nuts | 39. Clamping ring handle |
| 17. Arm-dowel pin | 40. Column |
| 18. Arm shaft | 41. Column driving-mitres |
| 19. Arm ways | 42. Driving-shaft coupling |
| 20. Arm rack | 43. Driving pulley |
| 21. Saddle | 44. Speed-change lever |
| 22. Reversing lever | 45. Speed-box case |
| 23. Back-gear lever | 46. Box table |
| | 47. Base |

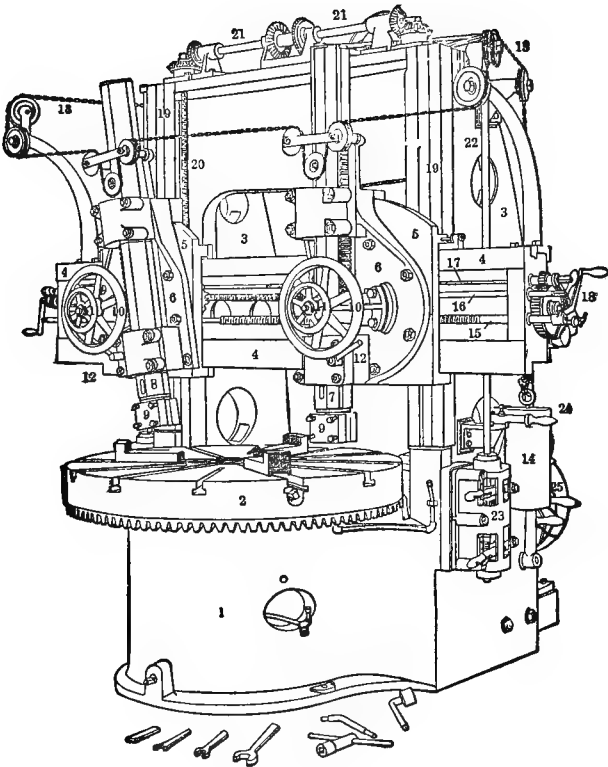


FIG. 6

BORING AND TURNING MILL

Having horizontal rotating table for the work with one or more stationary vertical tools for boring, turning, or facing

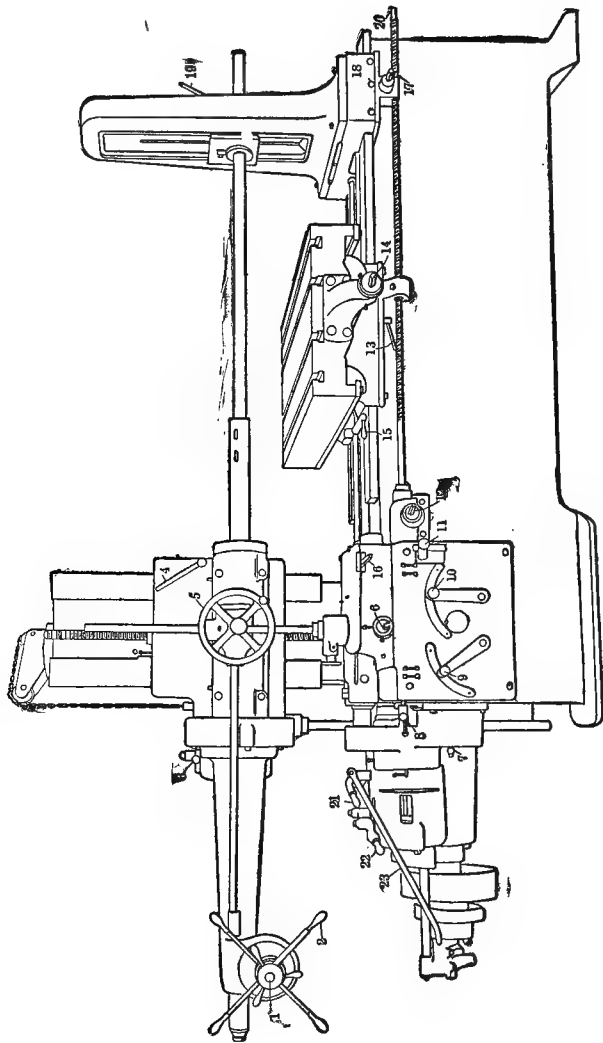


FIG. 7
HORIZONTAL BORING MACHINE

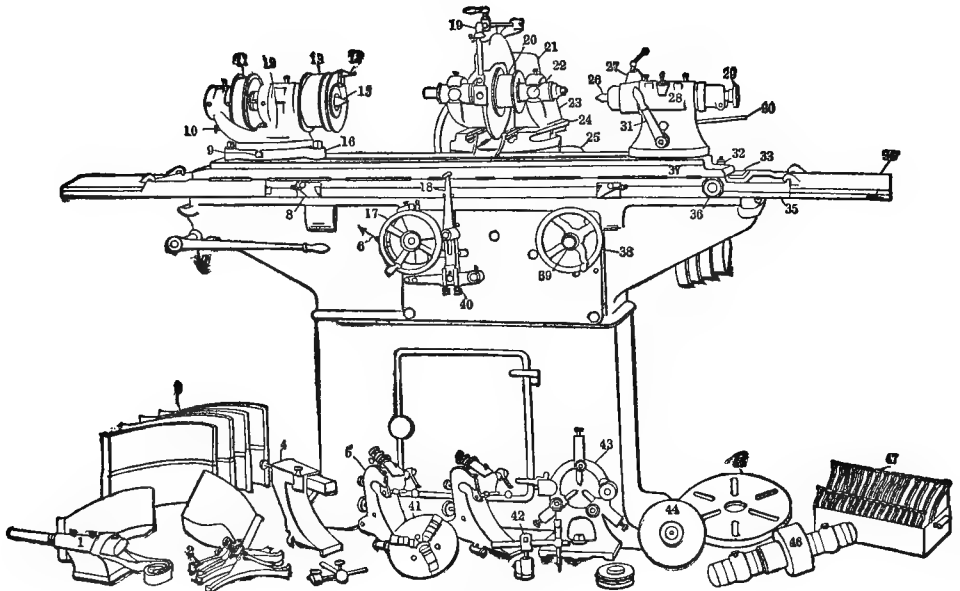


FIG. 8

GRINDING MACHINE

- | | |
|---------------------------------|-------------------------------|
| 1. Internal grinding fixture | 25. Wheel stand slide |
| 2. Water guard supports | 26. Footstock center |
| 3. Water guards | 27. Diamond tool holder |
| 4. Plain back rests | 28. Footstock |
| 5. Universal back rest | 29. Tension-adjusting knob |
| 6. Automatic cross-feed pawl | 30. Quick-adjusting lever |
| 7. Starting and stopping lever | 31. Clamping lever |
| 8. Table-reversing dogs | 32. Clamping bolt |
| 9. Headstock index finger | 33. Table scale |
| 10. Live spindle-locking pin | 34. Bed water guard |
| 11. Live spindle-driving pulley | 35. Sliding table |
| 12. Headstock | 36. Swivel table knob |
| 13. Dead center pulley | 37. Swivel table |
| 14. Work driving arm and pin | 38. Hand wheel |
| 15. Headstock center | 39. Table travel control |
| 16. Headstock base | 40. Automatic cross feed |
| 17. Cross-feed hand wheel | 41. Universal chuck |
| 18. Reversing lever | 42. Tooth rest |
| 19. Water piping | 43. Center rest |
| 20. Wheel-driving pulley | 44. Face-grinding chuck |
| 21. Wheel guards | 45. Face plate |
| 22. Spindle box | 46. Internal grinding counter |
| 23. Wheel stand | 47. Work-driving dogs |
| 24. Wheel stand platen | |

scratching of work; how to eliminate chatter marks, steady the work, and properly lubricate bearing parts. He should understand cutter sharpening, and the methods employed for grinding various tools.

SPECIAL MACHINE WORKERS

There are special machines for doing particular portions of the work possible on the machines already considered in the foregoing pages; *e.g.*, centering machine for drilling and reaming centers for work for the lathe or grinder, special lathes and key seaters for cutting keyways in shafts or hubs of pulleys or gears. There are also special automatic machines, as the automatic screw cutting machine. The knowledge required by the operator of each of these machines is similar, but of narrower range, to that required for the corresponding machine of wider scope.

SUMMARY OF THE TRADE STUDY

The findings indicate a trade representing a considerable number of workers in New York City now increased to abnormal proportions on account of the war who are distributed in a few large establishments and a number of plants of medium size.

They show that New York City is not a machine manufacturing center but a great repair district—where repairs to marine engines, railroad, elevated, subway, and street car equipment, elevators, motor vehicles and central power plants, together with upkeep of machines as in the printing trade, the garment trade and other industries, employ a large number of workers.

They show that the industry is one constantly making use of new methods and new machines and that the tendency is towards the substitution of the machine operator or specialist on a semi-automatic machine for the all-around machinist. On the other hand the survey indicates that the repair work which constitutes such a large proportion of the whole, requires to a large extent broadly, well equipped workmen. The situation shows also a demand of highly skilled workers for jig, gauge and tool making. Furthermore, the fact that considerable numbers of low skilled operators are employed in the manufacturing plants indicates a relatively large need of supervisors or foremen.

The survey, also shows a trade in which the workers are only partly organized and which is operated partly under open and

partly under closed shop conditions, and one in which trade agreements applying to the trade as a whole are lacking.

The findings indicate a trade, the full mastery of which requires exceptional mechanical intelligence, but which offers for such intelligence unusual rewards in the way of superior work and opportunities for foremanship and other positions of responsibility. They also show a trade which perhaps offers more than any other exceptional opportunities to the man with inventive capacity.

The survey shows that very few plants in New York City maintain an apprenticeship system and that the number of apprentices so trained represent almost a very small element in the total situation. It is apparent that the tendency towards specialization is against apprenticeship and that this together with the higher immediate wage of the machine tender or operator is responsible for the fact that the trade is recruited mainly through this latter channel.

The findings show a trade that offers many lines of advancement either in the direction of superior work, foremanship, or other positions of responsibility, but for all such advancement, demand an equipment beyond that gained through routine work. Mechanical drawing, elementary mathematics, elementary physics, mechanism, applied mechanics, properties of materials, are all necessary to a greater or less degree, to the man who would go forward in the machine industry.

Apprenticeship may give a broad basis for advancement, but it must be an apprenticeship which outside of varied training in practical processes affords instruction in the subjects mentioned above.

The machine operator or specialist gains all he needs in routine work as far as a particular job is concerned, but if he is to advance he must either shift from shop to shop—a difficult and unsatisfactory method—or obtain outside opportunities both for broadening his practical experience and for supplementary instruction.

These conditions would seem to present a need for pre-employment classes that would give breadth of practical experience and a knowledge of the elements underlying mechanical intelligence and for evening classes offering both practical training and instruction in drawing, mechanism, shop mathematics, mechanics and properties of materials for those already in the trade.

OUTSIDE AGENCIES FOR THE TRAINING OF MACHINISTS

CLASSES ESTABLISHED BY THE BOARD OF EDUCATION

The Board of Education has established two trade preparatory courses in machine shop work in the day vocational schools and twenty-two trade extension courses in machine shop work in seven evening trade schools. The following paragraphs describe very briefly the work carried on in these schools. Detailed information concerning these classes is given in Part Five of the Report.

Day School Courses: The courses offered in the day vocational schools are open to any boy fourteen years of age, who is a graduate of the elementary school, or who can show that he is prepared to take the work by successfully passing an examination given by the principal of the school. The courses are two years in length and the boy spends one-half of his time in the machine shop and the remainder of his time in drawing, mathematics, science and other subjects. At the time of the survey in March, 1917, there were 270 boys enrolled in machine shop classes in the day vocational schools. Two hundred and twenty-four of these boys were in the machine shop classes at the Boys' Vocational School and forty-six at the Brooklyn Vocational School. Six teachers of machine shop work were employed for these classes.

At the Boys' Vocational School the boy who enters the machine shop department spends three-sevenths of his shop time for the first term in the machine shop; two-sevenths of his shop time in the forge shop and the remainder of his time is equally divided between the sheet metal shop and patternmaking. During the second term he spends four-sevenths of his time in the machine shop and three-sevenths of his time in the forge shop. The second year he is allowed to specialize in machine shop work or auto machine work.

The machine shop equipment provided for this school is not large enough to accommodate the large numbers of boys enrolled for the work and as a result it is necessary to place two boys at each machine. Shop work consists largely of making of exercises.

Very little attempt was made to manufacture a product that might be used in the vocational schools.

The work at the Brooklyn Vocational School is so organized that a boy registered for machine shop work spends fifteen periods a week in the machine shop. The equipment in this school is also limited and as a result it is necessary for two boys to work at a machine at one time or part of the boys are assigned to bench work. There was no attempt made in this school to manufacture additional equipment for the machine shop or for the other shops in the school.

Evening Trade School Courses: At the time of the survey there were twenty-two trade extension courses in machine shop work in the seven evening trade schools with an enrollment of 460 pupils. Twenty-one classes in machine shop practice and theory were visited by members of the survey staff. Four of these classes were in the theory of machine shop work and seventeen in machine shop practice. Approximately 90 per cent of the students enrolled in these classes were working at machine or allied trades during the day. The schools offering courses, the number of classes and the numbers enrolled in each school are as follows:

1. Brooklyn Evening Trade School, five classes of machine shop work, 107 enrolled.
2. Harlem Evening Trade School, two classes machine shop work, 29 enrolled.
3. Stuyvesant Evening Trade School, four classes in machine shop work, 89 enrolled; one class machine shop theory, 33 enrolled.
4. Murray Hill Evening Trade School, three classes machine shop theory, 48 enrolled.
5. Bushwick Evening Trade School, four classes machine shop work, 86 enrolled.
6. Long Island City Evening Trade School, two classes machine shop work, 38 enrolled.
7. No. 95 Evening School, two classes in machine shop work, 30 enrolled.

All instruction in machine shop work was individual in character and planned in so far as possible to meet the individual needs of the pupils. This was necessarily modified where the equipment was limited. Large numbers of pupils desired instruction in milling machine work but the limited equipment prevented



MACHINE SHOP CLASS—BROOKLYN VOCATIONAL SCHOOL

the schools from accommodating the applicants. In nearly all the classes visited, the men were working from blue prints or free-hand sketches and usually worked out the mathematics connected with this problems. In one school the pupils were building a lathe; in the other schools the work consisted largely of exercises. The courses in the theory of machine shop work consisted of lectures on machines, materials, shop methods and processes and allied subjects. The students were also given some work in related mathematics and in blue print reading. Instructors spent part of their time taking up the individual problems of the students and used them for class problems. In most cases the courses were well planned and the students took an active interest in the work.

COURSES MAINTAINED UNDER PRIVATE AUSPICES

Machine shop instruction is much farther advanced in the endowed schools of New York City than in the public schools. This applies to equipment, extent and methods of teaching, and practical results obtained. This fact justifies a somewhat detailed account of the courses offered by these schools, the amount of time given to the work, and the numbers receiving instruction.

There are three institutions of this class in the city equipped for machine shop instruction—The Baron de Hirsch Trade School, The Hebrew Technical Institute, and Pratt Institute.

The Baron de Hirsch Trade School: Courses are provided in nine trades, including a course in machine work, each course requiring five and one-half months for its completion on the basis of eight hours a day, a total of about 820 working hours. Of this number, 730 hours are devoted to practical shop work, with the remaining 90 hours to correlated work in mechanical drawing and shop arithmetic. Two classes of Jewish boys, 16 years of age or over, are admitted each year, one about the first of February and the other the middle of August.

The Hebrew Technical Institute provides a general course in technical training during the day. The course is three years in length. During the second year instruction is given in the use of chisels, files and small tools; chipping and filing; speed lathe work; and the use of drill press, planer and shaper. In the third year the student may specialize in more advanced machine shop work and instrument making. From these specialists many enter the machinists' trade. At present there are 27 students taking the machine shop work.

There are two evening classes; one in tool making and one in instrument making, die making and machine work. The former has 19 students enrolled and the latter 21. Machinists over 19 years of age are admitted without regard to religious faith.

Pratt Institute. In addition to requiring work in machine shop practice from its students in the courses of mechanical industries, applied electricity and applied chemistry, this school conducts a one-year day course in the machinists' trade, with 23 students in the present class.

This course is planned to prepare young men to fill positions as foreman and assistant superintendents in machine shops and factories, and similar positions where a thorough knowledge of machine construction is required, but where an extended theoretical training is not essential. It is intended to give those who are already in the machinist's trade a thorough understanding of the principles of machine work, tool-making and methods of economical production, which will help them to promotion into positions above the grade of the ordinary mechanic.

The evening classes are planned to supplement the practical experience that the student gets in his daily shop work, and to give him an opportunity to acquire the kind of technical knowledge which will make him more proficient in his work and enable him to advance to positions of greater responsibility.

The course in machine work and tool making continues through three seasons of about 25 weeks each; three evenings per week. One hundred and twenty-one pupils were in attendance at the time of the survey.

One hundred and twenty-one machinists are enrolled in the present class.

In order to serve the present national need for increased productive efficiency in this country's machine shops, and to aid in supplying the extraordinary demands for machinists arising from the war, this school has instituted a "National Service Evening Course in Machine Work." The classes in this course meet two evenings a week. The classes which began May 16, 1917, continued for six weeks, had 75 enrolled, and those which began July 9th, continued for ten weeks, had 200 enrolled.

The Survey Committee desires to express its indebtedness to the publishers, the McGraw-Hill Book Company, and to the authors, Messrs. Colvin and Stanley, for the use of illustrations from "Machine Shop Primer."

RECOMMENDATIONS OF TRADE COMMITTEES

Members of the Executive Board of the National Metal Trades Association and the Conference Committee of the Machinists' Union considered the report of the machine trade. Both committees recorded their conviction that in the highly specialized condition of the machine trade outside instruction is necessary to secure a thoroughly comprehensive training.

The committees made the following recommendations:

1. That the Board of Education establish a Central School of the Metal Trades and concentrate in it all the machine shop equipment now used in the Boys' Vocational School and the Brooklyn Vocational School. (Attention is called to the fact that pattern making, forging and foundry work are allied trades and might well be considered in developing a Central School of the Machine Trades).

2. That the Board of Education bring together in the Central School of the Metal Trades the day courses in machine shop work now offered in the day vocational schools. This committee also recommends that the attendance at the day machine shop classes be limited to 300 boys.

3. That evening classes be maintained for the men engaged in machine shop work and that the following courses be considered:

1. Blue print reading,
2. Shop mathematics,
3. Course in cost finding,
4. Freehand sketching,
5. Machine shop theory,
6. Mechanics of materials,
7. Elementary shop drawing,
8. Advanced shop drawing,
9. Layout work for die makers,
10. Course for tool makers,

11. Theory of steam engines and boilers (condensing and non-condensing types),
 12. Course in theory of internal combustion engines,
 13. Theory of refrigeration,
 14. Course in testing by hydrostatic pressure,
 15. Course in lathe work,
 16. Course in milling machine work,
 17. Course in planer work,
 18. Course in slotter work,
 19. Course in grinding,
 20. Course in drill press work,
 21. Course in bench and floor work,
 22. Course in the use of pneumatic and electric tools.
4. That in so far as possible, part-time classes be established for the first and second year apprentices in the trade.
5. That the Board of Education install a modern machine shop equipment in the Central School of the Metal Trades.

6. That the Board of Education require a registration fee of \$2.00 of all men in the trade who desire to take evening courses; that such fee shall be returned upon the completion of 75% of the course.

The Committee of the Metal Trades Association made the following recommendation :

7a. That an Advisory Committee be appointed by the National Metal Trades Association to assist the Board of Education in developing a Central School of the Metal Trades; and that such Committee make recommendations on the following points:

1. Equipment,
2. Courses of study,
3. Training and experience of teachers,
4. Checking up the work of the school from time to time to see that it meets the practical needs of the trade,
5. Tests to determine the pupil's fitness for promotion or to enter the trade.

The committee of the Machinists' Union made the following recommendation :

- 7b. That a special advisory committee of nine members be

appointed to assist in developing the Central School of the Metal Trades. That such committee be made up of four employers representing employers' associations, four employees representing unions, and one other member to be selected by these eight. That the Board of Education consider the recommendations of this committee on the following points:

1. Equipment,
2. Courses of study,
3. Training and experience of teachers;
4. Tests to determine the pupil's fitness for promotion or to enter the trade,
5. Inspection of the work of the school to see that it meets the practical needs of the trade.

The following arguments in favor of a Central School for the Metal Trades were discussed and approved by both committees:

1. A good machine equipment is very expensive. The establishment of a Central School of the Metal Trades would make it possible to provide a modern equipment that could be used for both day and evening work.

2. A central school would have an enrollment large enough to make it possible to secure teachers with special training for the following subjects:

1. Special branches of shop work,
2. Related drawing,
3. Mathematics and science as related to the trade.

3. A principal of the school who is familiar with the trade and can secure the hearty co-operation of the employers and employees. Such a man could work out the courses of study for the day and evening schools and might serve as supervisor of all evening trade extension courses in machine shop work.

4. In giving effective vocational training, one condition that must be met is that the training shall be given to the group of individuals who have already determined that they wish to be trained for that particular trade or occupation. Any organization that does not provide effective means for selecting the group taken into the schools according to the above basis is inadequate. A central school backed by the interests of the trade, dealing in part-time and trade extension classes with workers in that trade,

set before the community as the headquarters of the trade, will present a situation much more likely to draw a group of pre-employment pupils who have already determined their desire to be trained for that trade.

5. The contact of pre-employment pupils in such a central school with the higher processes of the trade, and with the workers in the trade, will exercise a strong influence in retaining them for attendance upon the full course of pre-employment instruction.

Both committees promised the hearty support of their associations in developing a Central School of the Metal Trades.

REPORT OF ADVISORY COMMITTEE

In the report of the Advisory Committee in Day Vocational Schools, the following paragraphs concerning the organization of day instruction in the machine trade appear:

In the printing and machine trades, the committee believes that there is not only a large number of ideas as to materials and methods, that in part at least can be taught effectively to boys in a pre-employment school, but that each of these trades is capable of absorbing each year a considerable number of boys of 16 or 17 years of age whose chances of advancement to high grade positions would be materially assisted by training in such schools.

On the side of the trade, such schools should furnish a supply of well prepared boys who have passed through an extended selective training and whose chances of success in the trade would be greater than those who have not had such preparatory training. If maintained in close co-operation with the industries, such schools should serve a helpful office in adjusting the supply of young workers to the needs of the trades.

In regard to the school organization best fitted for such training, they believe that in the case of printing, the instruction should be given in a central school, for the reasons that more complete equipment and a more comprehensive teaching organization can be so secured, greater co-operation with the industry is possible and better control could be had over the numbers entering training in relation to the needs of the trade.

The extensive and differentiated equipment of such a school would also be of great value in serving other phases of instruction, such as evening classes for journeymen and apprentices and part-time classes for the younger apprentices. The same con-

siderations obtain in regard to a central school for the metal trades.

A specialized central school backed by the interests of the trade dealing in part-time and trade extension classes and standing before the community as the headquarters of the trade, will present a situation much more likely to attract a group of pre-employment pupils who have already formed their desire to be trained for that particular trade than schools in which this trade course appears only as element among other courses.

The contact of pre-employment pupils in such a central school with the higher processes of the trade and with the workers in the trade will exercise a strong influence in retaining their attendance for the full course of pre-employment instruction.

In the report of the Advisory Committee on Evening Schools appears the following:

This committee heartily endorses the recommendations of the committees appointed by the Allied Printing Trades Council and the Association of Employing Printers, for the establishment of a centralized school of printing and also the adoption of the courses of study suggested by these committees for evening trade extension classes in printing. This committee also has the firm conviction that it is advisable to bring together in one school wherever practicable, all evening classes in the same field or work in order that through this larger grouping, pupils may be more readily and carefully graded as to their previous training, experience and ability. This plan will tend to improve the character of instruction and make possible much better and more far-reaching results than are at present obtainable. This arrangement also makes possible a larger and more satisfactory equipment than can be had under the present plan of widely distributed classes in the same subjects.

THE ADMINISTRATION OF INDUSTRIAL EDUCATION IN NEW YORK CITY

In dealing with the various forms of industrial education that have been introduced into the public school system of New York City during recent years, little attempt has been made to develop an administrative organization especially fitted to direct this new type of activity. Control of this work has been lodged in the elaborate system developed to administer work of the conventional type and few adjustments have been made to meet the peculiar and exacting needs of the new form of instruction.

Six statutory authorities more or less affect or control the development and activities of the vocational schools, as follows: The State Department of Education, The Board of Estimate and Apportionment, The Board of Aldermen, The Board of Education, The Board of Superintendents and The Board of Examiners. The state law also provides that an advisory board of five members representing the local trades, industries and occupations shall be appointed by the Board of Education. Such an advisory board was appointed for New York City in November, 1915, but as its powers were not specifically stated in the statute it has not been able to exert any considerable influence upon the situation.

The State Department of Education: The New York State Education Law of 1910, Section 94, contains the following provisions as to the control of the Commissioner of Education over the public schools of the state:

He is the chief executive officer of the state system of education and of the Board of Regents. He shall enforce all general and special laws relating to the educational system of the state, and execute all educational policies determined upon by the Board of Regents.

He shall have general supervision over all schools and institutions which are subject to the provisions of this act or of any statute relating to education, and shall cause the same to be examined and inspected and shall advise and guide the school officers of all districts and cities of the state in relation to their duties and the general management of the schools under their control.

He shall have general supervision of industrial schools, trade schools and schools of agriculture; he shall prescribe regulations

governing the licensing of the teachers employed therein; and he is hereby authorized . . . to provide for the inspection of such schools . . . and to advise and assist boards of education . . . in the establishment, organization and management of such schools.

In a bulletin on vocational schools issued by the University of the State of New York May 1, 1913, the following conditions are laid down by the Commissioner of Education as necessary for sharing in allotments of state funds:

1. That the school shall be maintained for thirty-six weeks, that it shall have an organization and a course of study and be conducted in a manner approved by the Commissioner of Education;

2. That the equipment must be suitable and sufficient for the proposed work and afford opportunities for practical experience in the occupations for which the pupils are to be prepared;

3. That the teaching force must satisfy the Commissioner as to ability to teach;

4. That courses of study for each school shall be left to the local authorities, who should submit their programs to the Commissioner of Education for revision and approval;

5. That pupils should be especially fitted for their intended occupations;

6. That mathematics, drawing and science should be taught in a way practically useful to the pupils in the particular occupations for which they are being trained;

7. The instruction should aid in the wise selection of an occupation and lead boys and girls to industrial careers.

Compliance with the foregoing conditions is necessary in order to secure the aid granted by the state to promote industrial training. The apportionment for each general industrial school, part-time, or continuation school, or evening vocational school meeting the state conditions amounts to a sum equal to two-thirds of the salary paid to the first teacher appointed in each school plus one-third of the salary to each additional teacher, the state aid for any one teacher, however, shall not exceed one thousand dollars.

The Commissioner of Education also recommends that the advisory board be consulted in outlining proper courses of study, in selecting practical equipment and in determining the vocational efficiency resulting from the vocational instruction. He suggests also that a special and separate advisory sub-committee might usefully be appointed by the advisory board for each important trade or occupation taught in the school. Such special sub-committee would preferably consist of two persons, an employer and an employee.

In order that the state may know that the requirements of the Commissioner of Education are met, the industrial classes are visited at regular intervals by one of the state inspectors in charge of vocational activities. Each year the work in some classes has not met with the approval of the inspectors and the state aid has been refused.

The Board of Estimate and Apportionment: The revised Charter of the City of New York* contains the following provisions as to the powers and duties of the Board of Estimate and Apportionment relative to the public schools:

The Board of Estimate and Apportionment and the Board of Aldermen of the City of New York may raise and collect by tax . . . such sum of money as may be necessary to provide for the conduct of the schools as called for by the budget adopted by the said Board of Estimate and Apportionment and the said Board of Aldermen pursuant to the provisions of this act.

The Board of Estimate and Apportionment shall appropriate for the general school fund an amount equivalent to not less than three mills on every dollar of assessed valuation of the real and personal estate in the City of New York.

The said Board shall annually between the first day of October and the first day of November meet and make a budget of the amounts estimated to be required to pay the expenses of conducting the public business of the City of New York, such budget shall be prepared in such detail as the said Board of Estimate and Apportionment shall deem advisable.

The Board of Estimate and Apportionment shall have the power at any time to transfer any appropriation for any year which may be found by the office having control of such appropriation to such other purposes as may require the same.

*The provisions of the above paragraph have been superseded by the following provisions in the new state education law which became operative June 8, 1917.

"The board of education in each other city (those having a population of over one million) shall prepare annually an itemized estimate for the ensuing fiscal year and file the same on or before the first day of September.

"If the total amount requested in such estimate shall be equivalent to or less than four and nine-tenths mills on every dollar of assessed valuation of the real and personal property in such city liable to taxation, the board of estimate and apportionment shall appropriate such amount. If the total amount contained in such estimate shall exceed the said sum of four and nine-tenths mills on every dollar of assessed valuation of the real and personal property of such city liable to taxation, such estimate shall, as to such excess, be subject to such consideration and such action by the board of estimate and apportionment, the board of aldermen, and the mayor as that taken upon departmental estimates submitted to the board of estimate and apportionment."

The special three-mill tax which the charter* decreed should be appropriated for the general school fund has only in part met the needs of the schools in recent years and the Board of Education has been obliged each year to secure the extra funds needed through the Board of Estimate and Apportionment.

The requirement that the budget for educational purposes be submitted by early fall, necessitated that estimates of the several amounts required be prepared by the school authorities in the spring of each year. Each division head must, consequently, estimate far ahead the amount required to operate his department for the coming fiscal year.

Although it is difficult for any division of the school system to estimate its needs far in advance, it is doubly difficult for those in control of the schools for vocational and industrial training. Such work is still in an experimental stage and consequently standards of costs have not been worked out. An extension of the work that is desired must not only meet the approval of the executive officers of the Board of Education and the board itself, but must also meet with the approval of the members of the Board of Estimate and Apportionment. The refusal of the Board of Estimate and Apportionment to include funds for the separate maintenance of the Murray Hill Vocational School and for the trade extension classes carried on in conjunction with the Manhattan Trade School for Girls in the school budget for 1917 illustrates the control this board has exercised over vocational education.

Board of Aldermen: The Board of Aldermen formerly had authority upon the recommendation of the Board of Estimate and Apportionment to provide by ordinance for the acquisition of school sites and the construction of new buildings, but under the new "Pay-as-you-go" policy as incorporated in the charter in 1916, it has practically no authority over the authorization of funds for new school buildings and sites. The Board of Aldermen may, however, reduce the amounts fixed by the Board of Estimate and Apportionment for the maintenance of the school system in the annual tax levy budget but such reduction is subject to the veto power of the Mayor which veto can only be overridden by a three-fourths vote of the Board of Aldermen.

The Board of Aldermen has no power of control in regard to the salaries paid to teachers, examiners and members of the super-

*Section 60 of the Revised Charter which provided the three mill tax was repealed by the new Education Law. See Section 881, subdivision 6.

vising staff of the Department of Education, but it has the power upon the recommendation of the Board of Estimate and Apportionment to fix the salaries of the clerical force of the Board of Education and the rates of compensation paid the janitors of the school buildings. The minutes of the Board of Aldermen show that many of their acts, an average of a hundred each year, concern the Department of Education. While these acts refer mainly to the wages of janitors and clerks the aldermen also have taken up such matters as providing for school luncheons and the supplies that are used in the schools.

The Board of Education: The revised charter* of the City of New York provides that a Board of Education consisting of 46 members shall have the management and control of the public school system of the city and that the board shall have power to administer all moneys appropriated for educational purposes in the City of New York.

The By-laws of the Board of Education provide for thirteen standing committees of from five to nine members each, the Committee on Vocational Schools and Industrial Training having seven members.

Each of the thirteen standing sub-committees of the Board of Education has certain clearly defined duties as well as other duties which are not so clearly defined. Few matters are presented to any committee that can be settled without being referred to some other committee of the Board of Education for its approval, or to some other board outside of the Board of Education. As each committee can only transact business at its regular meetings or special meetings called by its chairman, this communication between committees must be done by time-consuming correspondence.

The By-laws contain the following reference to the Committee on Vocational Schools and Industrial Training:

Section 22a. 1. The Committee on Vocational Schools and

*The sections of the charter relating to public education are superseded for the most part by the new education law which provides that a city having a population of one million or more shall have a board of education to consist of seven members, and which sets forth various specifications as to the powers of the board concerning the creation of positions, appointment of officers and teachers, maintenance of schools, purchase of sites, construction of buildings and administration of moneys appropriated for educational purposes. It remains to be seen just how the organization of the new board of seven members will differ from that designed for the larger board.

Industrial Training shall have charge of all matters relating to vocational training in the special day schools devoted to that purpose and of all matters relating to evening trade schools and afternoon vocational courses established in day schools.

2. Recommendations of the Board of Superintendents with regard to selection of textbooks, books for supplementary reading, apparatus and other supplies for vocational schools, for evening trade schools and for afternoon vocational courses established in day schools shall be filed with said committee and shall be transmitted, with its recommendations as to approval or disapproval, to the committee on studies and text books for action thereon.

3. Except when otherwise ordered by the board, said committee shall conduct all trials of principals and teachers in the schools specified in subdivision 7 of this section, against whom charges have been brought and shall report its conclusions to the board for action thereon.

The chairman of this committee in reply to a questionnaire submitted to him stated that his committee has interpreted the by-law which states that it shall have charge of all matters relating to vocational training "to mean that all matters concerning the schools which require the approval of the Board of Education shall be considered by the committee and reported upon with recommendations to the Board of Education."

"Courses of study have not been submitted by the board of superintendents to the vocational schools committee, but have been tentatively approved by the superintendent in charge of vocational activities, because it has been recognized that full latitude should be given to the principals of these schools to develop courses of study from the practical needs of industry and all the educational value of each activity until such time as it would be possible to standardize these courses."

"Employers' associations and unions have not been asked to assist in the development of the course of study in trade subjects. Representatives of trade unions have been requested to visit the schools and to offer suggestions. One delegate did offer suggestions to Dr. Ettinger as to the introduction of certain topics in civics which suggestions have been followed."

Board of Examiners: Both by provisions in the charter and in the new education law a board of examiners is designated for the City of New York. It is the duty of this board to hold examinations whenever necessary to examine all applicants who are required to be licensed or to have their names placed upon eligible lists for appointment in the schools in such city, except examiners, and to prepare all necessary eligible lists. The board may employ

temporary assistants at a compensation fixed by the Board of Education. The influence of the board of examiners upon the industrial work is discussed under the section relating to the licensing of teachers.

Board of Superintendents: Both the charter and the new education law provide that there shall be eight associate superintendents, and the superintendent of schools and such associate superintendents shall constitute a board of superintendents. They both provide that the board shall possess among others the following powers:

"To prepare the content of each course of study authorized by the Board of Education.

"To recommend suitable lists of textbooks to be used in the schools.

"To transfer teachers from one school to another.

"To make rules for the promotion and graduation of pupils.

"It is also provided in both instruments that the Board of Education on the recommendation of the board of superintendents shall designate the kind and grades of licenses for all positions in the teaching and supervising staff below that of district superintendent, together with the qualifications required for each kind or grade of license.

"And that all members of the teaching and supervising staff except associate superintendents and examiners shall be appointed by the Board of Education upon the recommendation of the board of superintendents."

It will be seen from the above quoted sections from the new education law that the board of superintendents are largely responsible for the direction of the school system. They recommend the textbooks and supplies, prepare the courses of study, designate the kinds of licenses and the qualifications required for each and nominate, promote and transfer principals and teachers.

In order that each member of the board of superintendents may specialize in some branch of administrative work, the board is organized into eight committees, each member of the board constituting a committee. The eight committees are (1) high schools and training schools; (2) elementary schools; (3) studies and supplies; (4) vocational activities; (5) duplicate and intermediate schools; (6) evening and vacation schools; (7) buildings and economy; (8) rules and service. The administration of the industrial work, so far as the board of superintendents is con-

cerned, is thus divided between two men; the day vocational schools, the continuation and co-operative schools are under the associate superintendent in charge of vocational activities, while the evening trade schools are under the associate superintendent in charge of evening schools.

The administration of the evening trade schools differs from that of the day industrial classes. The charter provides that twenty-three of the district superintendents shall be assigned by the city superintendent to the work of supervision in the local school board districts and the remaining three district superintendents "shall be assigned by the city superintendent to such other professional duties as the welfare of the school system may require." Under this provision the city superintendent has assigned one of the district superintendents to be in charge of the evening schools. The day industrial classes are thus directed by the associate superintendent in charge of vocational activities while the evening trade classes are directed by the district superintendent assigned to this work by the city superintendent of schools.

SUPERVISION OF INDUSTRIAL CLASSES

The direction of the day vocational schools is only a small part of the work required of the associate city superintendent in charge of vocational activities. Likewise, the evening trade schools, registering as they do less than one-tenth of the total number enrolled in the evening schools, are far from being the most important part of the evening school work. In selecting men to serve as associate superintendents and as district superintendents, the Board of Education apparently chose men whose training and experience was such as to fit them for the larger duties they were to perform. The result is that there is no one in charge of the industrial work in either the day schools, the evening trade schools, co-operative or part-time classes, who by training or experience can be said to be a specialist in the field of industrial education.

Day Vocational Schools: The chart on page 30 represents certain significant data in regard to the teaching organization, courses of study, enrollment and equipment in the day vocational schools. This would seem to bring out a certain want of unity in the policies governing the work of these schools together with the absence of certain elements generally considered essential to efficient school management. Some of the situations that appear are as follows:

1. In the Manhattan Trade School, the Murray Hill and the Brooklyn Vocational Schools the teachers of academic subjects are teachers who were receiving the maximum salary in the elementary school and were given \$200 additional salary when they were transferred to teach in the vocational school. Ever since its organization in 1909 the teachers of academic subjects in the Boys' Vocational School have been chosen from the list of substitute teachers awaiting appointment to permanent positions in the elementary schools and have been paid the salary of substitute teachers.

2. Except in the Boys' Vocational School, the academic teachers have a five-hour day and a year of ten months, while the trade teachers have a seven-hour day and a school year of eleven months. In the Boys' Vocational School the academic teachers as well as the trade teachers are employed for seven hours a day for a school year of eleven months.

3. In the Murray Hill and the Brooklyn Vocational Schools for boys, the trade teachers are selected from the substitute list and paid the salary of substitute teachers. This has been true since these schools have been organized. The salary of substitute teachers is about half the schedule for regular trade teachers and less than half the salary paid the teachers of academic subjects who teach but five hours a day. The Manhattan Trade School for Girls also uses substitutes for the teaching of trade subjects and pays the teachers of academic subjects from two to three times as much as is paid to the teachers of trade subjects. The Boys' Vocational School, on the contrary, has a majority of its trade teachers on the regular salary schedule and uses substitute teachers for the academic subjects.

4. In the Boys' Vocational School and the Manhattan Trade School the trade classes and the academic classes are about the same size. In the Murray Hill and Brooklyn schools the classes in the academic subjects average twice as large as the trade classes. In these two schools the large academic classes were made up of groups from different trades and different semesters which made it practically impossible to secure correlation between the academic and trade instruction.

5. The poor quarters, inferior equipment and overcrowded classes of the Murray Hill and Brooklyn Schools possibly are the reasons why the shop work in these two schools consists mainly of exercises. All of the shop work in the Manhattan Trade School is commercial in character. In the Boys' Voca-

tional School the printing is a commercial product, as is also some of the work in the sheet metal and woodworking shops.

The Part-Time Industrial Classes and the Industrial Co-operative Classes: The part-time industrial classes have not been organized for a sufficient length of time for them to be out of the probationary stage. The courses of study are in the process of formation and so show all the strength and weakness incident to the beginning of any new form of school activity. In some plants there was a very close correlation between the classroom instruction and the shop work of the boys attending these classes. In others the instruction was general in character and no correlation existed between the two.

The energies of the co-ordinators in the co-operative classes seem to have been devoted to securing new firms with which to co-operate and new pupils to take the places in these classes of those boys and girls who were leaving the course. As a consequence little time was left for the co-ordinators in which they could supervise the character of the instruction offered in the schools. As in the case of the part-time industrial classes there were conspicuous instances where the classroom instruction was tied closely to the shop work of the pupil, but when such was the case it seemed due more to the superior ability, interest and energy of the classroom teacher than because of any supervision which the teacher had received.

The attitude of the associate superintendent in charge of the day vocational schools, co-operative and part-time industrial classes toward the work of supervision is indicated by the answers to a questionnaire submitted to him.

Ques. Do you feel that supervisors should be provided for each of the principal trade subjects taught in the vocational schools or can the work be supervised successfully by the principal?

Ans. No. Principals possess the requisite technical knowledge for the successful supervision of trade subjects. Qualifications for principals include practical experience in the trades.

Ques. Are conferences held between the teachers of like trade subjects in the different vocational schools?

Ans. No. The organizations are different.

Ques. What can this committee recommend that will be most helpful to the advancement of industrial education in New York City?

Ans. The greatest service your committee can render is to recommend the establishment of a vocational bureau along the following lines: (a) Superintendent of Vocational and Industrial Education, (b) Technical Director, (c) Chief Mechanician, (d) Draftsman and Statistician, (e) Clerk and Stenographer.

(a) The Superintendent of Vocational and Industrial Education should be a broad-minded, sympathetic executive, and possess a thorough knowledge of local school problems. He should have full power to carry out the policies of the Board of Education unhampered and unrestrained by details.

(b) The Technical Director should relieve the Superintendent of all technical work. He should be held responsible for the equipment, installation and maintenance of the machines, tools, and apparatus necessary for instruction purposes; supervise shop and academic instruction; assist principals and teachers in their work by holding conferences, etc.; suggest and lay out courses of study for new work, or modifications of old ones when necessary; plan enlargements; standardize equipments; scrutinize and approve requisitions; secure necessary data for statistical purposes, and undertake the solution of the thousand and one problems of a technical character which present themselves daily in every great undertaking. He should be a man who has received the training of an engineer, and who, in addition, has had considerable practical experience in teaching trade subjects. He should bear to the Superintendent the same relation that the chief engineer bears to the president of a railroad.

(c) The Chief Mechanician should be under the direct supervision of the Technical Director. It should be his duty to repair all machinery and apparatus used for instruction purposes; keep all installation at their highest efficiency. He should assist the Technical Director in his work. One of his functions should be experimental work for the purpose of determining the feasibility from the standpoint of time, expense, and its effects on the pupils of manufacturing material for use of the Bureau of Supplies, and other city departments. It is evident that he should be a thoroughly competent mechanic.

(d) The Draftsman and Statistician should look after layouts required for new equipments; collate and put into presentable form various statistics required for various reports; take charge of a well-organized card system covering every phase of the work, including equipment, supplies,

repairs, efficiency tests, courses of study, vacancies, substitutes, applications, assignments, conferences, reports, trade catalogs, quotations, drawings and tracings, blue prints, etc.

(e) Clerk and Stenographer. The purposes for which the incumbents of these positions are desired are self-evident.

Evening Trade Schools: The supervision of the evening trade classes is left almost entirely to the principal of the school. A fuel engineer from the department of supplies is assigned as supervisor of trade classes and trade equipment. This lack of central supervision is shown in the content of such courses of study as have been prepared; the varied standards for the admission of pupils to trade classes; the different kinds of instruction offered in classes having the same titles; the facilities provided in the way of equipment and supplies; and the lack of co-operation between the schools and the employers' associations and the unions most vitally interested in the subject in which instruction is offered. Some of the results of this lack of supervision might be listed as follows:

1. The courses of study in any trade subject, being the work of the individual instructor, showed as great a variation in their character and content as is shown in the teaching of the subject. Because practically every plumber who attends the evening school does so in order that he may learn to wipe lead joints, the courses of study and the instruction in this subject are very similar in all schools. The mechanical drawing classes, for example, composed of pupils representing many different industries and occupations, are widely different not only for different schools but also for the pupils of the same trade group, such as machinists, in the same school.

2. The rules of the Board of Education require that the attendance in evening school classes be limited to workers in the trade or branch of the trade. The liberal interpretation of the word "branch" on the part of some of the principals of the evening trade schools produced groups having representatives of as many as a dozen different occupations in the same class.

3. A course in mechanical drawing might, as in one school, be copying drawings from blue prints or books, or it might be blue print reading for machinists, or structural steel designing; shop mathematics might be either general arithmetic taught to mixed groups from a so-called vocational arithmetic, or it might be a carefully worked out and graded series of problems based upon some one occupation.

4. Those evening trade schools that are located in day schools having superior facilities for trade instruction have this same equipment for the use of the evening school classes. On the other hand, there are trade classes where the teachers must furnish all of the equipment and supplies that are used by the pupils.

5. Little attempt has been made to secure the co-operation of employers' associations and unions in the work of the evening trade classes for the city as a whole. Such co-operation as has been secured has been the work of individual principals and confined to the trades where all of the trade instruction is centered in one school. In the important trade groups, such as machine shop practice, printing, plumbing and electrical work that are taught in several schools, there was no evidence that either the employers' associations or the unions had been an important factor in determining the course of study, the entrance requirements or the character of the instruction offered.

The district superintendent in charge of evening schools submitted the following replies to the questions concerning administration submitted to him:

Ques. Do you hold regular meetings with the principals of the evening trade schools?

Ans. During the first year of my administration I endeavored to hold regular meetings with all the principals. I found it did not pay. It was too great a task on the principals and the results were better served (a) by personal interviews on my visits specifically and (b) through circularization generally.

Ques. Do you hold general meetings of evening school teachers of trade subjects?

Ans. I do not.

Ques. Have you ever arranged to have all the teachers of any one trade come together to work out courses of study and a general method of work?

Ans. Each principal is supposed to call together and in fact does call together at more or less frequent intervals all the teachers of one trade to work out with him courses of study and general method of work.

Ques. What provision has been made for the special supervision of the teaching of each of the different trades taught in the evening trade schools?

Ans. The Board of Education has assigned Mr. John R. Cave as Supervisor of Trade Classes and Trade Equipment.

CHART SHOWING THE DIFFERENCE IN ORGANIZATION IN THE FOUR VOCATIONAL DAY SCHOOLS

Name of School	Brooklyn Vocational	Murray Hill	Boys Vocational	Manhattan Trade School
Length of Course	Two years	Two Years	Two Years	One Year
Percent of Elementary Graduates in Total Enrollment	98%—8th Grade Graduates	83%—8th Grade Graduates	82%—8th Grade Graduates	70%—8th Grade Graduates
Time given to academic courses	Four-sevenths	Four-sevenths	One-half	Two-sevenths
Teachers for academic courses	Transferred from elementary school	Transferred from elementary school	Substitute teachers waiting for assignment	Transferred from elementary school
Hours for trade and academic teachers	Trade—7-hr. day Academic—5-hr. day	Trade—7-hr. day Academic—5-hr. day	Trade—7-hr. day Academic—7-hr. day	Trade—7-hr. day Academic—5-hr. day
Length of school year for teachers	Trade—11 mos. Academic—10 mos.	Trade—11 mos. Academic—10 mos.	Trade—11 mos. Academic—11 mos.	Trade—11 mos. Academic—10 mos.
Salaries for trade and academic teachers at time of survey	Trade—\$5 day Academic—\$2600 yr.	Trade—\$5 day Academic—\$2600 yr.	Trade— $\frac{1}{2}$ \$1500 to \$2500 $\frac{1}{2}$ \$5.00 day Academic—\$5.00 day	Trade mainly substitutes at \$2.50 to \$3.50 a day Academic—\$1700 to \$2000
Size of classes	Trade, 12-24 Academic, 20-60 Average, 40	Trade, 1-30: average, 18-20 Academic, 20-50: average, 40	Trade, 10-30; mostly, 18-22 Academic, 10-30 mostly, 18-22	Trade, 10-25 Academic, 20-35
Holding power of school	30% to 35% who enter complete the course	20% to 25% who enter complete the course	35% to 40% who enter complete the course	35% to 40% who enter complete the course
Character of shop work	Mainly exercises	Mainly exercises	Commercial in printing, Sheet metal, woodwork. Other shops mainly exercises.	All work done in shops a commercial product
Building and Equipment	Crowded quarters, equipment limited	Both building and equipment unsuited to trade instruction	Building and equipment best in the city	Building poor — equipment fair

He observes and inspects various kinds of trade classes and makes report to me. The general supervision, however, of the trade classes is left to the principal, who is a selected expert and presumably competent to supervise the work.

Ques. In your opinion what provision should be made for the supervision of the evening trade classes?

Ans. At present I am satisfied with the amount of supervision that we have. Later I should like supervisors representing various general trades to work each a certain number of evenings in supervision. By general trades I mean one printing expert who would examine into all the classes that have anything to do with that trade.

Advisory Board: An advisory board was appointed for the City of New York in November, 1915. Up to the present time the board has been consulted to a certain extent in regard to the selection of equipment and some other matters, but very few questions have been submitted to them for their consideration and on the whole the committee has had little influence in directing the policy of industrial education in the city.

Summary: The conditions herein outlined concerning the administration of vocational and industrial schools indicate a situation of divided responsibility and one that is lacking in expert control and adequate supervision. The lack of centralized responsibility makes it almost impossible to deal with the problem as a whole and the fact that no provision is made for the supervision and direction of the various divisions of day vocational schools, evening trade schools and part-time and co-operative classes by persons of special training and experience prevents assurance either of unity in the organization and methods of such divisions or of full efficiency in the work of the teaching units. It is evident also that the present arrangement of one advisory trade board reporting to the Board of Education has not in practice proven an effective plan to develop a real influence on the part of employers and employees on the conduct of industrial education. It would seem that much more specific definition of powers and much more intimate representation of the various trade interests concerned in industrial school work are essential to make this influence effective.

RECOMMENDATIONS OF THE ADVISORY COMMITTEE ON THE ADMINISTRATION OF INDUSTRIAL EDUCATION IN THE NEW YORK CITY SCHOOLS.

The value of the work done by the Board of Education of New York City in the field of industrial education will largely depend on the form of organization that is adopted for conducting it. The work of the survey has convinced those engaged in its studies that this new line of work cannot be largely successful unless it is organized on a plan providing for efficient administration and future expansion to a degree not possible under the conditions that now obtain in the administration of the work.

Essentials of Good Administration: The essential basis for the efficient administration of any extensive co-operative activity may be summed up in the three words, "organize, deputize, supervise." It is as true in the administration of industrial education as in almost every other sort of collective effort that the efficiency of the work and the character of the results are largely determined by the leadership that directs the project. In order to attain such efficiency the government of the system must depend on organized direction rather than on personal preference or individual control. It must be an organization in which each man contributes his share to effective team work by having a clear understanding of the scope of his own duties and of his relationship to the man above, the one at his side, and the man below.

Authority and Responsibility: In a scientific organization responsibility must be definite, not vague; authority must be concentrated, not scattered. Powers and duties must be so allotted that no man in the organization will be responsible to two superiors. The lines of authority and responsibility must always be through the officers charged with varying degrees of power and duty and never over, under, or around them. This means that the lines of authority must be the same as the lines of responsibility.

The Pyramid Type of Scientific Organization: There is a form of organization which possesses the desirable characteristics that

have just been described. It may well be termed the "pyramid form of scientific organization." It has been developed through centuries of human experience until it is now the generally accepted form of control in armies and on ships. It is a form of organization consisting of a series of groups of workers so arranged in a well-ordered system that each group has a leader who in turn belongs to a group of other leaders of equal status, all looking to a still superior leader for guidance. It is a form of organization by systematic classification and combination of graded groups.

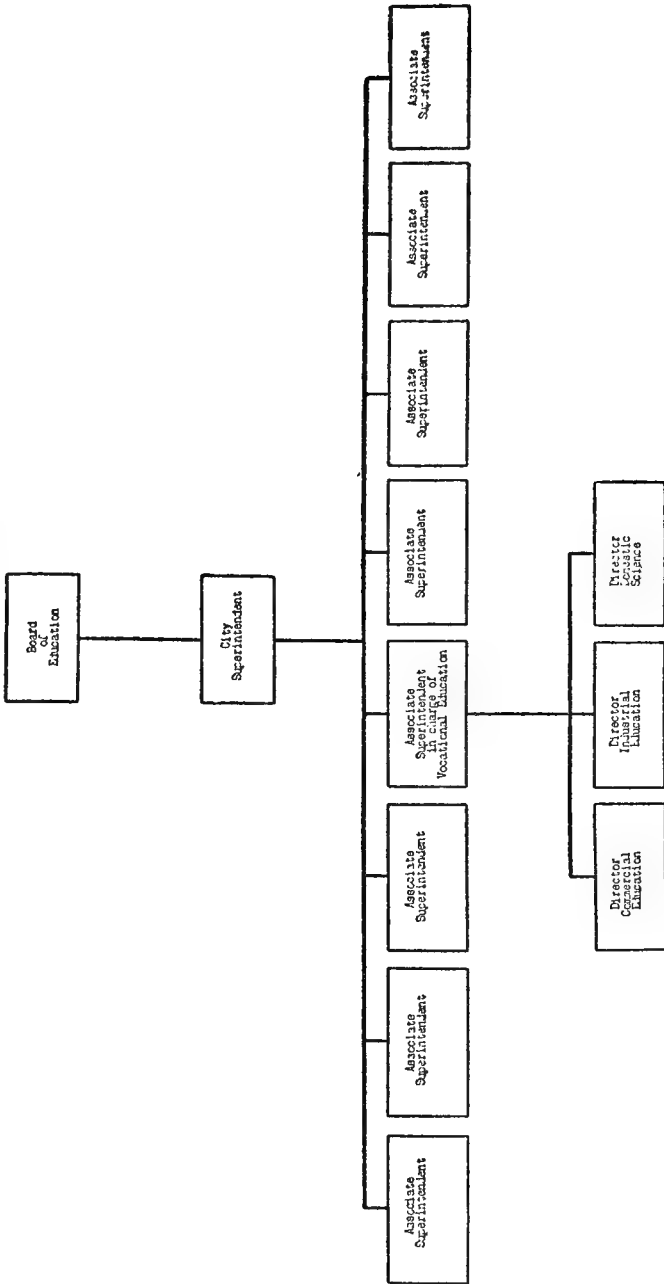
At the base of the pyramid are the private soldiers, the common sailors, or the classroom teachers, as the case may be. These are responsible to under-officers or heads of departments, who in turn look to their lieutenants, mates, or principals for guidance. These are under the direction of still higher officers such as captains, masters and directors until by similar progressive graduations the ultimate authority and responsibility is lodged in the general, the admiral or the superintendent.

If such an organization is carefully worked out along valid lines, each man in it will have clearly defined ideas of his duties, his responsibilities, and his powers. He and his co-workers will substitute choice for chance and compel chaos to give way to co-ordination.

The Organization of Industrial Education in New York City: A scheme is herein proposed for organizing industrial education in the City of New York on the plan described. It is graphically presented in three accompanying charts. Chart 1 (p. 34) shows the outlines of the system. At the top of the chart and the top of the system is the Board of Education. Deriving his powers from the board is the executive officer, the city superintendent. Below the city superintendent are the eight associate superintendents, one of whom is charged with the duty of administering vocational education in the city. This official exercises leadership over the three great divisions of vocational education, viz., commercial education, industrial education, and home economics.

Ideally this officer should be a person of extended experience and proven ability in the field of vocational education, and it would seem desirable in filling future vacancies in the board of superintendents that endeavor be made to secure such a person for the duties of this position. Until this can be accomplished it may be well to appoint an assistant to the associate superin-

CHART 1
ORGANIZATION CHART FOR ADMINISTRATION OF INDUSTRIAL EDUCATION IN THE CITY OF NEW YORK
(ADVISORY COMMITTEE)



tendent designated for this work, who possesses the above qualifications and to whom could be delegated the actual supervision and direction of vocational education.

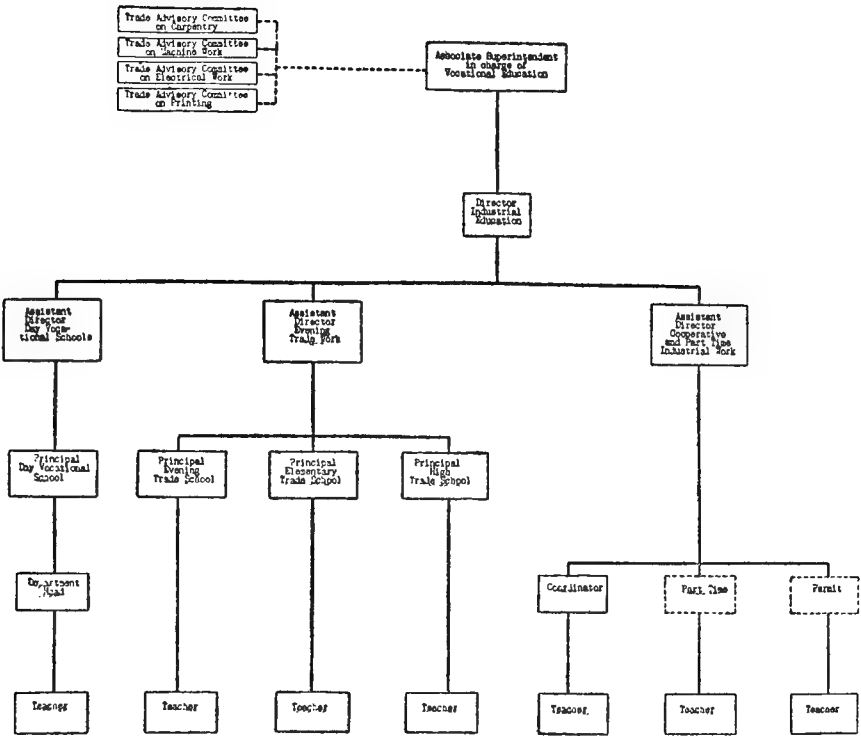
In a complete scheme for vocational education there would be a separate diagram showing in detail the organization of each of the above three main branches. For the purposes of the present report only one of these has been developed. Chart 2 (p. 36) shows the organization plan for industrial education. It will be noted that the different officials are designated according to the office that they hold. The line of authority and responsibility runs directly and without break from the board to the city superintendent in charge of vocational education. Subordinate to this general director there are three assistant directors in charge respectively of day vocational schools, evening trade work, and part-time industrial work.

The whole system of day vocational schools is organized under the authority of the first of these three assistant directors. Immediately subordinate to him are the principals of the several day vocational schools. Under each principal is a number of heads of departments within his school, and finally below these department heads are the teachers of the different subjects. In the chart each of these grades is shown as a single unit, but in reality each one below the grade of assistant director is multiplied several times or as many times as the number of schools may require.

A similar organization is found under the assistant director of evening trade work. Here there are principals of evening trade schools, elementary trade schools, and high trade schools. There might be department heads subsidiary to these officials if the development of the work required it, but the chart is drawn in conformity with present conditions with the lines of responsibility running down directly to the shop and classroom teachers.

A similar plan would fit the case of the organization of the co-operative and part-time work. There is one assistant director in charge. In this case there are no principals of schools since the work is organized by classes and the lines fall directly to the co-ordinators and the teachers. In the case of the part-time classes and the permit classes the position corresponding to that of co-ordinator has been indicated by dotted lines so as to show that the position of supervisor might be created as the future needs may demand but that it is not as yet necessary.

CHART 2
ORGANIZATION CHART FOR ADMINISTRATION OF INDUSTRIAL
EDUCATION IN THE CITY OF NEW YORK
(ADVISORY COMMITTEE)



Non-Vocational Industrial Work: Chart 3 (p. 38) relates to what may be termed "Non-vocational industrial work." This consists of manual training and of the shop work in the schools organized on the Ettinger and Gary plans. These forms of industrial work are not truly vocational because they do not have for their controlling principle the direct preparation of the pupils for money-earning occupations. Their work is general in character. It has for its object the making of a contribution to the all-round education of the boys and girls. This distinction as to the essential character of the work is one of the reasons for showing the organization in a separate chart.

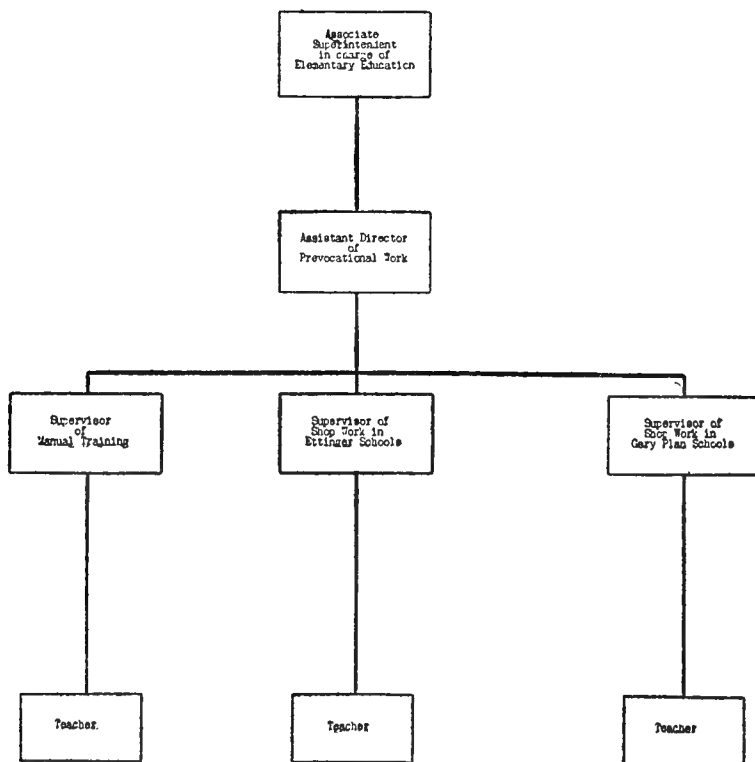
There is in addition a second reason and this is to be found in the difference between the kind of control exercised over the trade schools and classes entering into Chart 2 and that exercised over the work of the non-vocational industrial classes shown in Chart 3. In the former case the trade schools involved are entirely under the jurisdiction of the different officials appearing in the chart and hence their powers are those of direction and control. In the case of the non-vocational classes appearing in Chart 3 the different officials exercise powers of supervision and advice but not direction and control.

Since the work of these classes contributes to general education rather than to strictly vocational education, and since the function of the different officials is supervisory rather than directive, it has been deemed wise to make a separate chart and to indicate the line of authority and responsibility as running up to the associate superintendent in charge of elementary education rather than to the associate superintendent in charge of vocational education.

It must be recognized, however, that for reasons of immediate efficiency and convenience of administration it might be found advisable to place the manual training classes and the shop work in the schools run on the Ettinger and Gary plans under the same general direction as that controlling the strictly vocational industrial schools. In this case Chart 3 would be added to the right-hand end of Chart 2 as an extension, and all of this work would be made subsidiary to the associate superintendent in charge of vocational education.

In order to insure the essential co-operation of the trades and industries in the administration of industrial education it is further recommended that advisory committees consisting of employers and employees be appointed by the Board of Education

CHART 3
ORGANIZATION CHART FOR NON-VOCATIONAL INDUSTRIAL
EDUCATION IN THE CITY OF NEW YORK
(ADVISORY COMMITTEE)



for each of the trades of printing, carpentry, machine work and electrical work. The functions of such committees cannot legally be those of control or veto. It is clear, however, that if they are accorded specific advisory powers and definite provision be made for the consideration of their recommendations the way will be opened for the exertion of a very real and important influence on their part. The relations of such advisory committees should be with the officer in charge of vocational education and this officer should be instructed, before action is taken upon such matters, to invite the recommendations of the committees as to the establishment of new industrial schools and classes; the selection of equipment; the content and length of courses of study; the requirements for graduation and certification; the number of pupils admitted to day vocational schools.

(Signed) LEONARD P. AYRES,
C. A. PROSSER,
DAVID SNEDDEN.

LICENSING AND EMPLOYMENT OF TEACHERS

BOARD OF EXAMINERS

As has been previously noted both by provisions in the charter and in the new education law a board of examiners is designated for the City of New York. It is the duty of this board to hold examinations whenever necessary, to examine all applicants who are required to be licensed or to have their names placed upon eligible lists for appointment in the schools in such city, except examiners, and to prepare all necessary eligible lists. The board may employ temporary assistants at a compensation fixed by the board of education.

Under the above positions the board of examiners is granted the power of selecting all of the teachers for the public schools of the City of New York. The table given below shows that the number of examinations given to those desiring to teach in vocational and pre-vocational schools was very small compared to the total number of examinations given by the board. The requirements for pre-vocational shop teachers are the same as those for vocational shop teachers.

TABLE SHOWING THE TOTAL NUMBER OF LICENSES GRANTED AND REFUSED DURING THE YEARS 1914, 1915 AND 1916 AND THE NUMBER OF LICENSES GRANTED AND REFUSED TO TEACHERS IN VOCATIONAL SCHOOLS.

	1914			1915			1916		
	Granted.	Refused	Total	Granted.	Refused	Total	Granted.	Refused	Total
Exams. given...	14,232	6,258	20,490	14,768	6,248	21,016	9,270	3,389	12,559
Teachers in Vocational Schools..	3	1	4	6	5	11	139	512	651

To examine over 21,000 people in a year intensively and extensively is a task so great that it is impossible for an outsider to comprehend its magnitude. In order that the board of examiners might supply the best type of teachers, "keeping out as many as possible of the relatively unfit and as few as possible of the relatively fit," the board is organized into 30 committees, each

committee representing a different type of license. The chairmanship of the several committees passes in rotation each year from one examiner to another, so that each member of the board influences each phase of the work of the school system. The only part of the work of the board that is described in this report is that dealing with the examination of the teachers of industrial subjects.

Requirements for Eligibility for Vocational Licenses: The requirements for eligibility for vocational licenses have been determined by the Board of Education and incorporated in the by-laws. These requirements, summarized below, give the educational and trade requirements for eligibility for the various grades of licenses:

1. To be eligible for a license as a principal of a vocational or trade school, the applicant must have one of the following qualifications:—

“(a) Graduation from a college or university recognized by the Regents of the University of the State of New York, together with ten years’ satisfactory experience in the practice of a trade and in teaching or supervision, provided that no less than two years of such ten years’ experience shall have been in the practice of a trade.

“(b) Graduation from a college or university recognized by the Regents of the University of the State of New York, together with ten years’ satisfactory experience in teaching or supervision, provided that not less than two years of such experience shall have been in teaching, supervision or investigation in vocational education.”

2. A substitute teacher of a vocational or trade subject in a vocational school for boys must have five years’ successful experience as a journeyman wage earner, or in a higher position, and a general education satisfactory to the board of examiners.

3. A regular teacher of a vocational or trade subject in a vocational school for boys must have in addition to the above requirements a year’s satisfactory service in teaching the same vocation.

4. A teacher of sewing (both regular and substitute) must have a high school education or its equivalent, together with the completion of a two-year course in domestic art in an approved institution.

5. A substitute female teacher-clerk must have had three years’ satisfactory experience in office work.

6. A substitute assistant female teacher-clerk must have had two years’ satisfactory experience in office work.

7. A substitute trade-order teacher must have had three years’ satisfactory experience in the special branch of the vocation, the substitute assistant trade-order teacher must have had two years’ experience.

8. A substitute vocational helper must have completed one year's course in a girls' vocational or trade school.

9. A placement and investigation teacher must have three years' satisfactory experience in placement and industrial work.

10. A license as teacher in a vocational or trade school shall qualify the holder to teach his subject in a vocational or trade school or in an evening trade school.

11. A supervisor or substitute supervisor of continuation classes must have a high school education and five years' experience in teaching or three years' experience in commercial or technical occupations, together with two years' experience in teaching.

Frequency of Examinations: When new positions are created by the board of superintendents or when vacancies occur the board of examiners are notified and eligible lists are prepared from which to select teachers to fill the positions. The claim is made by members of the board of examiners that it has not been possible for them to ascertain sufficiently far in advance the needs of the vocational schools.

The vocational lists are good for three years. They are renewed except where something unsatisfactory appears in the record of the candidate during the first three years. The license of a man who has an unsatisfactory record as a substitute during the first three years may not be renewed.

How Examinations are Advertised: The vocational examinations are advertised as follows:

1. Copies of the circulars announcing the vocational examinations are sent to the New York daily newspapers. One newspaper publishes the circulars in full and several other papers publish a synopsis of the announcement.

2. The circulars are sent to all the institutions east of the Mississippi River that train men for vocational work. These institutions include technical institutions such as the Sheffield School, Massachusetts Institute of Technology, Stevens Institute, etc.

3. The announcements are sent to the headquarters of the trades unions in the respective branches covered by the examinations. The list used for this purpose is found in the Eagle Almanac.

4. The circulars are sent to the superintendents of schools in the large cities east of the Mississippi River.

Order of Examinations: The written examination is the first given to a candidate for a regular license to teach in a vocational school. If the candidate passes this examination he is permitted

to take the practical and oral examinations which are usually given on the same day. A candidate who passes successfully these examinations is given the physical examination and if he passes it his name is placed on the eligible list.

Second Examination: If the candidate fails in either the practical or the oral examinations or both, he is, upon appeal, given within a few months another test before another set of examiners. This is true in all examinations whether vocational or academic.

Written Examination: The purpose of the written examination is to ascertain whether the candidate is qualified to explain in writing the details of his work, the methods of shop processes, the operations of machines, etc., and to show how he would present certain points in lessons. The questions are intended to be not academic but practical, so that practical men who speak good English and have a reasonably good command of language may pass the examination.

Questions for the written examination are submitted by various experts to the board of examiners who take these questions and put them in the final form for the examination. When considered necessary, outside help is secured in determining the questions to be used.

The written examination counts 20 points out of the 100 points. The passing mark is 60% of the 20 points or 12 points. This examination is what might be called a pass examination and not strictly a competitive examination, the margin of difference being only eight points out of 100 points between the candidate who passes the examination and the one who gets the maximum credit of 20 points.

If a candidate fails on the written examination he is not allowed to take the practical examination.

Practical Examination: The second part of the examination of the candidate for a vocational license is the practical test to determine the candidate's ability as a trade worker. Until about six months ago nearly all of the practical tests were given in the school shops. During the past few months the board of examiners have made an effort to hold the practical examinations in shops outside the school where the equipment is typical of commercial practice. The last examinations in printing, book-binding, sheet metal and automobile repairing were held in outside shops. Mr. O'Connell of the board of examiners has stated

that "no more practical examinations will be held in school shops if we can possibly avoid it."

The practical tests are usually from one hour and a half to three hours in length and consist in working out one or two practical problems.

Oral Examination: The oral examination is usually held in connection with the practical test and lasts approximately from fifteen to twenty minutes. This examination is given by one of the members of the board of examiners. The purpose of this examination is to eliminate those who are unfit because of defective English, unsatisfactory personality or inability to explain simple matters about which inquiries might be made by pupils in the school. Set questions are not asked in this examination. A marking slip is used and the salient points of the candidate's answers and the remarks of the examiner are indicated on this slip.

Physical Examination: A physical examination is given by one of the regular physicians of the Board of Education to determine the candidate's physical condition.

Teaching Experience: A candidate for a regular license to teach in a vocational school must have at least one year's satisfactory service in teaching the vocation in which he desires a license.

Passing Marks: The table below shows the passing marks and the weighting for the different parts of the examination for vocational teachers:

TABLE SHOWING PASSING MARKS FOR VOCATIONAL SCHOOL EXAMINATIONS.

	Maximum. Minimum.		
Written Examination.....	20	12	(60%)
Practical Experience	10	7	(70%)
Teaching Experience.....	20	14	(70%)
Practical Test.....	30	21	(70%)
Personality	20	14	(70%)

Substitute Licenses: The examination for a substitute's license to teach shop work in a day vocational school includes the written, oral and practical tests described above. This examination is less difficult than the examination for a regular license and is

aimed to determine in a general way a candidate's fitness to teach. A substitute's license is good for one year, but may be renewed annually by the superintendent of schools.

Evening Trade School Licenses: An applicant for a license to teach a trade subject in an evening school may qualify under any of the following requirements:

(a) Graduation from an approved college or university recognized by the Regents of the University of the State of New York.

(b) Eligibility for license as teacher in day high school.

(c) A high school education or its equivalent, and the completion of a satisfactory course of at least one year in the special subject or in lieu of such course, two years' experience in day or evening schools teaching the special subject.

(d) Four years' satisfactory experience in the practice of the subject for which the applicant seeks a license.

The examination for a regular license to teach shop work consists of a written, practical and oral examination. The license is renewable from year to year upon recommendation of the principal of the school and the district superintendent in charge of the school.

In case of emergency, substitute licenses are issued to candidates who meet the requirements described above.

Credit for Trade Experience: A candidate who has had a longer trade training that is required for eligibility to take the examination (*i.e.*, for five years' experience in the trade) may be given a credit of one year for each three years' practical experience up to an allowance of three years. This method has not been satisfactory due to the fact that it does not sufficiently attract the experienced trade workers. As a result of the above condition the board of examiners often make exceptions and give allowances which will cause the first year's salary to be the equivalent of what the men actually earn in the trade. The board are revising the rules so as to make the allowances for outside training more attractive.

Credit for Teaching Experience: The allowance for outside teaching experience is more generous than for trade experience. The board of examiners allow for outside teaching experience in excess of the year of experience required for eligibility, at the rate of one year of credit for each two years of teaching experience up to a maximum allowance of three years for teaching experience or trade experience, or both.

Number of Candidates Examined: The table on page 41 prepared by the board of examiners shows the number of candidates examined, the number of licenses granted, the number of candidates who failed and the reasons for the failures of those examined during the year 1916. The chart shows that a large number, 512 out of 651, failed to pass the examination. The figures presented would indicate that 323 candidates failed on the written examination, which is intended by the board of examiners to be not academic but practical so that practical men who speak good English and have a reasonably good command of language may pass the examination.

CHART NO. 4

RESULTS OF EXAMINATIONS OF 1916 FOR LICENSES TO TEACH VOCATIONAL SUBJECTS.

(N.B.—The figures given under the reasons for refusals cannot be totaled with respect to each subject, inasmuch as some candidates were refused licenses for two or possibly three of the reasons listed.)

—Refused on Account of—

	Total	Granted	Written	Oral	Practical	Record	Ineligible	Withdrawal	Medical
Power Machine Operating.....	14	4	8	..	..	1	2	.	.
Sheet Metal Work.....	13	7	..	..	2	.	.	1	.
Electric Installation and Practice.	52	16	11	11	11	7	6	4	.
Agriculture	8	..	4	..	1	7	6	4	.
Novelty Work.....	10	3	4	..	..	1	2	.	.
Sewing and Dressmaking.....	54	22	17	8	3	3	11	1	.
Woodworking	56	14	35	4	6	2	3	1	.
Tile Laying	10	..	6	..	..	.	.	.	.
Applied Science	5	1	2	..	1	.	1	.	.
Women's Garment Designing.....	5	2	3	..	..	.	.	.	.
Art Weaving	1	0	..	1	..	.	.	.	.
Architectural Drawing	68	..	44	3	5	.	1	.	.
Bookbinding	14	4	11	..	..	.	1	.	.
Millinery	36	20	6	3	3	1	7	.	1
Mechanical Drawing	17	2	9	..	3	2	1	.	.
Sign Painting	15	4	3	2	1	1	1	1	.
Machine Shop Practice.....	75	11	44	7	11	3	.	.	.
Printing	61	12	23	5	7	3	4	2	.
Modeling	11	4	4	..	..	.	1	.	.
Plumbing	79	5	56	3	9	.	.	1	.
Automobile Repairing	15	7	5	1	1	.	1	.	.
Trade Drawing (June, 1916)....	14	..	14	..	..	.	.	.	.
Trade Drawing (2d in Oct., 1916)	18	1	14	1	..	1	2	1	.

Assistant Examiners: Chart No. 5 prepared by the board of examiners gives a list of the vocational examinations held during the year 1916-1917 and the names of the assistants in the written, practical and oral examination. This list shows that in a number of cases certain individuals assisted in conducting examinations in trades of widely varying character who could not have had extended practical experience in the trade.

CHART NO. 5
DEPARTMENT OF EDUCATION
The City of New York
OFFICE OF THE BOARD OF EXAMINERS
500 Park Avenue

Assistant Examiners employed in 1916-1917 examinations in Vocational Subjects.

Subject	Readers of Written Papers	Assistants in Oral and Practical Tests
Bookbinding	Adeline E. Simpson	Adeline E. Simpson James Strang
Novelty Work	M. L. Hutchinson	Morris E. Siegel Annie B. Moriarty
Agriculture	Morris E. Siegel	Morris E. Siegel
Sign Painting	Morris E. Siegel	Messrs. Patterson, Otter- bein and A. J. Gude Ernest Yalden
Clay Modeling	James P. Haney	John E. Wade
Art Weaving	Mattie M. Schilling	Leon W. Goldrich Morris E. Siegel
Woodworking	George F. Stahl	George F. Stahl A. W. Garrett
Electric Wiring	Chris. A. Kassenbrock Charles B. Howe	George J. Loewy Chris. J. Kassenbrock Charles W. Mitchell
Sheet Metal Work	John T. Robinson	Charles B. Howe M. J. Harrison
Trade Drawing	Morris E. Siegel John E. Wade	John E. Wade George F. Stahl
Power Mach. Operating	Florence M. Marshall	Morris E. Siegel Annie B. Moriarity
Millinery	Mrs. Annie L. Jessup Miss Minnie L. Hutchinson	Minnie L. Hutchinson Annie B. Moriarity Mary B. Dickman
Dressmaking	Mrs. Annie L. Jessup Miss Minnie L. Hutchinson	Mrs. Annie L. Jessup Florence Willard

Subject	Readers of Written Report	Assistants in Oral and Practical Tests
Plumbing	James M. Joyce Michael F. Conlon	George J. Loewy Robert W. Rodman
Mach. Shop Practice	Stanley A. Gage Betram A. Lenfest	Stanley A. Gage Betram A. Lenfest
Printing	Hobart H. Todd Oliver G. Andrus	Morris E. Siegel Leon W. Goldrich Charles E. Fitchett
Applied Science	Robert W. Fuller	George J. Loewy Robert W. Fuller
Mechanical Drawing	T. Harry Knox	Frank Gardner Charles B. Howe
Arch. Drawing	A. B. Greenberg E. C. Zabriskie	George J. Loewy Morris Greenberg
Tile Laying	Charles B. Howe	(Not yet held)
Automobile Repairing	H. C. Brokaw	Mr. Breckenbridge (57th St. Y. M. C. A.) John Cave
Designing of Women's Cloaks and Suits	Morris E. Siegel	Morris E. Siegel Max Meyer
Trade Drawing	Adolph J. Grubman	John E. Wade

Attitude of Board of Examiners: That the board of examiners devote much thought to the means necessary to secure the best type of instructors for trade classes in spite of the many difficulties they have to overcome is shown in the report of Examiner O'Connell for 1915 to Superintendent Maxwell:

"The number of applicants for vocational school licenses is very large and the variety of subjects taught in the vocational schools and classes extensive. To enable the system to obtain the best applicants requires unusual care and much time. I fear that the proper amount of attention and investigation cannot be given to the applicants unless the board of examiners gets proper assistance. It is true that in the past we have, as occasion required, employed in an advisory or examining capacity certain high school first assistants and others skilled in the trades. This assistance, though given cheerfully, must of necessity be hurried, as well as intermittent and often done under unsatisfactory conditions. The selecting of trade teachers has become a matter requiring the greatest skill and care and because of the number of applicants and of subjects to be taught it will hereafter take a vast amount of time and labor even under favorable circumstances."

In writing about evening school licenses Mr. O'Connell says:—"The board has endeavored to make all tests as practical as possible. This idea is carried to the extreme in the examinations for trade subjects in evening high schools. In bookbinding, blacksmithing, costume design, jewelry design, mural decoration, etc., the applicants were required to do a piece of practical work or to submit for inspection attested practical work (or photographs thereof). In the oral examination which followed the test or accompanied the inspection of the attested work, considerable weight was given to the applicants' evidence of successful practical experience."

Attitude of Those in Charge of Day and Evening Vocational Courses Toward Methods of Licensing Teachers.—The associate superintendent in charge of vocational training in reply to a questionnaire submitted to him stated that he considered the chief defects in the present methods of securing and licensing of teachers of vocational schools to be:—

- (a) "A false conception of what is desired in a trade teacher.
- (b) "Methods employed in examining.
- (c) "Methods employed in rating examinations."

In reply to the question "What changes would you suggest that would tend to procure better teachers?" he recommended:—

"1. Taking the examination of trade teachers out of the hands of the board of examiners, and placing it in the hands of a committee composed of a member of the board of examiners, a principal of a vocational school, two representatives of the trade, in which the candidate seeks a license, and an employer of the trade.

"2. Examinations should extend over a longer period and take into account a man's practical experience at the trade to an extent that is not being done at present.

"3. More latitude should be given the principals in the choice of teachers. The mere standing of a candidate of any eligible list should not hamper the work of a school."

In a questionnaire submitted to the district superintendent in charge of evening schools a number of questions were asked relative to the training and certification of evening teachers of trade subjects. The questions submitted and the answers are given below:

Ques. Who selects the teachers for the evening trade classes?

Ans. Teachers for evening trade classes are selected in order of merit from the eligible lists. These eligible lists have been formed under the law according to the charter

by the board of examiners. The examination is mostly oral plus practical test. Practical test is conducted by some acknowledged expert assigned by the board of examiners and the practical test is held either in a shop or preferably in one of the evening trade schools.

Ques. Who is assigned by the board of examiners to give the examinations to candidates desiring to teach trade subjects?

Ans. Answered in preceding question partly.

The oral examination is held usually by a committee of three, the chairman of the evening school department of board of examiners, at present Mr. O'Connell; the district superintendent in charge of evening schools, at present Mr. Henry E. Jenkins, and a selected trade expert. The two non-trade experts merely judge the man from the pedagogic side, from his manner and ability to expound and explain. In other words, judgment of his probable teaching ability. The expert judges as I stated in a preceding question, by the selected expert.

Ques. Would you recommend the establishment of evening normal courses for mechanics desiring to teach in evening trade schools?

Ans. I would not recommend normal courses in evening schools. I have already removed such as were in our evening schools and we had a number. Evening schools were made for the distinct purpose of teaching those who through unfortuitous or other circumstances are not able to attend school in the day time. The ideal trade school would be the type of the mechanical school where the workman left his employment at day at the expense of the shop. At present this work is of course voluntary. I should under no circumstances desire to have us establish normal courses.

Ques. To what extent could such a course take the place of the examination for a license to teach in evening trade schools?

Ans. No course should ever take the place of examination. The course is a recommendation and should assist in raising the rating of the individual and his position on the eligible list, but I do not believe in any applicant for a license to teach anything, being exempt from examination.

Ques. Would you rather select your evening school teachers from the ranks of the day school teachers or from the trade workers? Why?

Ans. This question has practically been answered in other answers, nor could I answer this categorically because I should desire to select from a properly prepared eligible list. I should like them from the ranks of day school teachers of vocational subjects who have been skilled workmen in trades and I certainly should prefer those to taking the skilled workmen out of the ranks who had had no training

or experience in teaching pupils. At the same time I should prefer a well informed intelligent man directly from the ranks of the trade worker rather than an ordinary day school teacher with a theoretical knowledge only and no proper amount of direct contact through work in a shop.

To be specific, we need for teachers in evening trade classes men who are fine representatives of practical trade workers, leaders in their trades who have had ambition enough themselves to attend courses in recognized institutes where preparation for teaching trades is made the specific object. The type of man possessing the practical plus the pedagogical training and having had ambition and intelligence enough to look for both, would be the best type of trade teacher and I am glad to say that in time the teachers on our eligible list for evening trade schools would come in that class.

I consider that the manner in which the board of examiners has handled this delicate and new form of problem is extremely gratifying. I believe that no other city has so large a number of well equipped and well trained teachers of evening trade classes as has our evening school system of the City of New York.

REPORT OF THE ADVISORY COMMITTEE ON LICENSING AND EMPLOYMENT OF TEACHERS OF INDUSTRIAL EDUCATION.

The board of examiners was constituted in 1898 for the purpose of removing the certificating and appointment of teachers of all kinds and grades from politics—a duty which the board has undoubtedly performed in a most commendable way.

At the same time, this strong desire on the part of the board to protect the schools from the evils of partisan politics forced the adoption of a more or less rigid system of examining applicants with the written test as the chief, and in most instances almost the sole, means of determining fitness to teach. This system has seemed to work satisfactorily—at least it has served as well or better than almost any other scheme would have done—in the selection of an eligible list of instructors in the so-called regular or academic subjects.

It has not, however, served satisfactorily in the case of teachers of practical or technical subjects where manual skill or the ability to use knowledge in a practical way has come to be regarded as absolutely necessary to the success of the teacher. The board has already recognized the need for greater flexibility in dealing with instructors in industrial or trade schools by

substituting a practical for a written test of the applicant's skill in shop processes—this test usually being given by the assistant principal or some instructor in the particular trade employed by one of the vocational schools of the city.

The number of teachers in vocational schools who have thus far been examined is so small, comparatively speaking, that the tests thus far given should hardly be regarded as more than experiments. Out of a total of 73,661 persons seeking licenses during the years 1912 to 1915, inclusive, only 77 applied for positions in the vocational schools.

It is evident from the report that the board looks upon the whole question of licensing teachers of shop and related shop subjects as being a new, a difficult and as yet unsolved problem. While it recognizes the need for flexibility in dealing with such teachers, the board is at the same time very jealous, and properly so, of the freedom of the schools from partisan politics which it has labored so successfully to establish.

What the members of the board desire most of all is some scheme for licensing teachers of vocational subjects which will test in an effective way the ability of the applicant to teach the subject successfully and will at the same time safeguard the whole process of certificating and selecting these teachers from party and personal influence. It is with entire sympathy with this aim of the board that the recommendations given below are made.

We recommend that the board appoint a special committee for every distinctive trade for which there is a need of teachers in either shop or related shop subjects. The members of the committee should be appointed for one year and should be reappointed as long as their services are satisfactory and they are willing to serve.

There should be three members, one of whom should be a member of the examining board in order to correlate the work of the board and its special committee; and two of whom should be trade education experts who are experienced in their knowledge of the trade and of education for the trade. The two lay members of the committee should be paid a per diem for the actual time given to the duties assigned to them as herein described, which need not, in our opinion, be more than five days annually.

The special committee on the certification of teachers for any given trade should be regarded and legally could be only an

agency used by the board to assist it in the difficult and highly specialized task of obtaining competent instructors for the schools in the shop and related shop subjects of that trade. The board would, of course, establish such general standards and such general rules and regulations for the guidance of the work of the committee as it found advisable from time to time. It should not, however, make these so detailed or so rigid as to prevent the committee from being of the largest possible helpfulness in passing upon applicants. All authority to pass finally upon the case of any applicant rests and should rest with the board. The duty of the committee should be that of recommendations to the board on the case, based on a complete handling of the case, and a filing with the board of all the papers regarding the applicant which the board should treat as the credentials on record in the case.

The special committee should avail itself of our different elements in examining teachers of trade subjects; written examinations, credentials, personal interviews and practical demonstration.

The efficacy of written examinations as the sole means of testing the general education of teachers has probably been greatly overestimated. Nevertheless, its long established use in connection with the certification of regular school teachers is certain to cause its employment for industrial school purposes.

The written examination can aid in some measure in establishing a presumption of fitness to teach. But this is true only if the examination is limited to a test of such knowledge as general schooling, technical and teaching equipment.

Written examinations are of very little value in testing the trade ability and personal equipment of candidates. So far as the trade instructors are concerned, it is also true that their general schooling and knowledge of trade matters can best be determined by proper credentials, practical demonstrations, and personal interviews.

Proper credentials should be given an important place in determining the fitness of an applicant. By credentials is meant evidence which may be accepted as bearing upon any feature of the qualifications of candidates for certification. Statements as to trade standing and skill furnished by employers and fellow-workers, diplomas, certificates, school records, correspondence school work; personal statements of former teachers; magazine articles or books written by the candidates; statements as to

teaching ability based on previous service as instructor of apprentices or as a teacher, should all be considered as credentials in this connection.

Those credentials are a most important device in certificating because they admit of flexibility in dealing with the case of any teacher. They can be made to represent the judgment of many persons from many different points of view. They furnish first hand information of a very real character as to the candidate's ability to do certain definite things and they have a bearing upon every feature of probable fitness for the work.

The personal interview is absolutely necessary to properly estimate the qualifications of the applicant in such matters as appearance, personality, health, adaptability and saneness of social and economic points of view. It also has an important use, supplementary to the written examination and credentials, in furnishing additional information concerning teaching equipment and trade experience. Such interviews should be conducted only by persons having both adequate knowledge and experience on the one hand and official responsibility on the other.

The practical demonstration may be used to supplement other tests. After all these devices have been employed, if any doubt exists as to the trade qualifications or teaching ability of the candidates they may well be required to perform a practical task of some kind, either in a commercial or school shop.

All the information of every kind concerning the applicant should be before the special committee in passing on the case. All this material together with recommendation of the committee should be presented to the board for final action.

Any plan for the certification of teachers of vocational schools should be based on a distinct classification of such teachers according to the kind of subjects to be taught and the status of the teacher in the service. Three distinct types of teachers will be needed:—teachers of shop subjects such as machine shop practice or composition work in printing; teachers of related technical subjects such as drawing, mathematics and science; and teachers of non-vocational subjects such as English and civics. The law also requires that all new employees of the Board of Education, including all members of the teaching and supervising staff, shall be appointed in the first instance for a probationary period of not less than one year and not to exceed three years; such period to be fixed by the Board of Education at its discretion. At the expiration of this probationary period, teachers shall, when rec-

commended for permanent appointment by the board of superintendents, be entitled to hold their respective positions during good behavior and efficient and competent service. This gives the examining board the duty of dealing with two classes of teachers within every classification of teachers made on the basis of subjects taught—probationary teachers and regular teachers.

In dealing with standards for teachers in vocational schools therefore it is necessary to consider the following six classes: probationary and regular teachers of shop subjects; probationary and regular teachers of related technical subjects; probationary and regular teachers of non-vocational subjects.

In suggesting certain definite standards for these teachers, the committee have had in mind only minimum requirements—the least qualifications which we believe the board of examiners should establish as a basis for the work of the special committees appointed to aid in passing upon applicants as above required. It is, of course, highly desirable that applicants should possess higher qualifications than those suggested.

Male applicants should be not less than 25, not more than 40 years of age; and in the case of women not less than 21 nor more than 40. The difference in the minimum age for men and women is made because, as is well known, the latter mature at an earlier age and because a smaller number of years is required to learn most of the women's trades. We believe, also, that applicants over 40 should not be accepted because they have reached the period when a certain fixity of mind and a shorter expectancy of life does not promise large returns in efficient teaching service to a school system. This, of course, applies only to beginners in the teaching work and should not operate in the case of a successful teacher over 40 desiring to enter the service in New York.

Three factors should be taken into consideration in passing upon the applicant: trade knowledge and skill, teaching ability and general education.

The Probationary Teacher of Shop Subjects: The applicant should, if a man, present evidence of at least five years of approved and successful experience or its equivalent in the shop work which he desires to teach. In the case of a woman, the applicant should present evidence of two years' successful experience in the trade or occupation approved by the committee or its equivalent.

The teacher of shop subjects should have at least a common school education or its equivalent.

The Regular Teacher of Shop Subjects: As has already been pointed out, a probationary teacher may, after a period of not less than one or more than three years of service as such, be appointed as a permanent or regular teacher in the position upon the recommendation of the board of superintendents. We recommend that the probationary teacher, when he can be promoted to the position of a regular teacher in the same subject, present evidence of two years of satisfactory teaching experience in his subject in the New York schools.

Attention is called to the fact that under this plan while any applicant from outside New York can meet the requirements for the probationary teacher, it will be necessary, whatever may be his previous trade and teaching experience, to serve two years as a probationary teacher of his subject in the New York schools before becoming a regular teacher. We believe this plan to be good as a means of obtaining and promoting good teachers if the salary schedule for the probationary teacher be made such as will make the work of a beginner desirable to promising men from outside as well as inside Greater New York.

In the case of women teachers, we recommend that the probationary teacher who began with a minimum of two years of trade experience, as what is known as a substitute or probationary junior teacher, be, after one year of satisfactory experience as a teacher of a trade subject, promoted to be a probationary second assistant; after a second year of such service, to be a probationary first assistant; and after a third year of such service to be a regular teacher of the subject.

The Probationary Teacher of Related Technical Subjects: The applicant should at least have a high school education or its equivalent. He should have, in addition as a minimum, 300 hours of additional instruction in the technical subject he desires to teach, or an experience in the subject accepted as an equivalent, or an equivalent in preparation and experience. In order that he may be able to apply his subject to the trade or occupation to which it is related, he should have had at least one year of actual experience in the trade or occupation concerned or one year of approved practical contact in some capacity with the trade or occupation.

Regular Teachers of Related Technical Subjects: As in the case of shop subjects, the probationary teacher of a related technical subject should after two years' satisfactory service be promoted to the position of a regular teacher in the same position.

Probationary Teachers of Non-Vocational Subjects. These positions are difficult to fill. At present they are obtained by transferring elementary school teachers.

Teachers of non-vocational subjects in an industrial school enter a field where few precedents exist. The vocational aim of the school demands a concrete and practical presentation of the non-vocational subjects such as is not common in our regular schools. Teachers of these subjects cannot expect to use in the industrial school the same subject matter or exactly the same methods commonly employed in the high school. They must be able to draw their material for the teaching of civics, economics, industrial history and English, from the work of the world. To do this, successfully, they do not need to have actual trade experience, desirable as such experience is, but they do need a layman's knowledge of the machines used and the trade processes taught in the school. They ought also to have a keen appreciation of the conditions and problems of modern industry and a sympathetic insight into the needs of the workers. A man or woman with some natural mechanical ability and interest in industry, is more likely to succeed in such work than one whose tastes are entirely academic.

The general education, personal qualifications and teaching equipment of teachers of non-vocational subjects should at least be equal to those of technical teachers.

Regular Teachers of Non-Vocational Subjects: These should be obtained by promoting the probationary teacher of such a subject after two years of satisfactory service.

Teachers of Industrial Evening Schools: All the foregoing applies only to teachers of regular day vocational schools. We do not see our way clear to recommend at this time the formal certification of teachers of evening industrial schools. It is altogether likely that the attempt to do this would not only interfere with the prompt employment of such instructors when needed but prevent the schools from securing some very competent teachers who now teach as an incident to their regular business.

The committee, however, desire to point out certain things which need to be taken into consideration in establishing standards for the employment of instructors in evening classes.

The qualifications of trade teachers for day industrial schools outlined above are equally desirable for trade teachers in the evening schools. In the case of these teachers, however, there are certain reasons why these standards must be slightly modified. For some time to come the trade teaching in the evening industrial school will probably have to be done by men and women who regard this work as incidental to their regular business. The short term of evening employment and the comparatively small wage make this inevitable. Instructors from the all-day industrial schools will constitute a small number of these teachers but the majority must be secured from the local industries. To persuade competent men and women in industry to undertake a teaching job in addition to their day's work is already sufficiently difficult. For this reason the qualifications of trade teachers, and especially those who are employed for short periods on special work, should be limited to only the most essential requirements.

The function of the evening industrial school is to give the worker an opportunity to secure further knowledge of his trade. It should deal for the most part with men and women who are presumed to have some knowledge of the trade in which they wish instruction. The prime requisite of evening trade teachers is, therefore, a thorough knowledge of their trade, or, in special instances, the specific branch of it they may be engaged to teach. Their skill, technical knowledge and trade standing must be such as will give them prestige in the eyes of their pupils. It is necessary that they have sufficient teaching ability to organize their subject matter and present it convincingly to their classes. They should have at least sufficient elementary school training to enable them to speak and write ordinary English. A good personality and ability to deal with men and women are also important assets.

(Signed)

C. A. PROSSER

ARTHUR D. DEAN

SAMUEL S. EDMANDS

DAY VOCATIONAL SCHOOLS

The Board of Education has established four day vocational schools to train boys and girls to enter industry. Of these four, the Boys' Vocational School was opened in September, 1909. A year later the Manhattan Trade School for Girls, up to that time a private philanthropic institution, was taken over by the Board of Education. The Murray Hill Vocational School for Boys and the Brooklyn Vocational School for Boys were opened in March, 1914, and June, 1915, respectively. In the three vocational schools for boys electric wiring, drafting, printing, woodwork, machine shop practice, plumbing, sheet metal, sign painting, modeling, commercial and garment design are the trades offered. The first four listed are taught in all three schools and the last three are taught in only one school. One third of all the boys registered in the three schools are studying electric wiring and ninety percent of all of the boys are in the four trade courses of electric wiring, machine shop practice, drafting and printing. In the Manhattan Trade School for Girls seventy percent of the girls are learning dressmaking. The remaining thirty percent are divided between machine operating, millinery, novelty and sample mounting. During the year 1915, a total of over \$190,000 was expended by the Board of Education for these four schools. The purpose of the survey has been to determine how well each school is equipped to furnish efficient trade instruction; how well each is meeting the demands made upon it and in the light of the experience of these four schools what changes or extensions, if any, are desirable to be made. So far as it has been possible the investigation has been kept to things that could be measured objectively, the expression of mere personal opinion has been avoided, and due allowance has been made for conditions which have been temporary in their nature.

BOYS' VOCATIONAL SCHOOL

The first public Vocational School for Boys established in the City of New York is located on 138th Street, Manhattan, and was opened on September 8th, 1909.

In the 1910 report of the city superintendent of schools is given an account of the opening of this school and the policy which the Board of Education adopted in regard to the pupils for whom the school was provided: "There remained, however, the opportunity to do something for that enormous class of children who leave school at fourteen years of age, though still far from completing the elementary school course, and who have been going out and are still going out into life with no adequate preparation for its work and its trials. In establishing the Vocational School for Boys a direct attempt has been made to provide suitable training for this very class. The terms of admission to the school are that a boy shall have reached the age of fourteen years and shall be able to pass an examination not more difficult than that required to obtain an employment certificate."

Trade Subjects: During this first year instruction was offered in the following trade courses:—

1. Woodwork, which included house carpentry, cabinet making, wood trimming, pattern making and the use of wood milling machinery.
2. Metal work, including machine shop practice, sheet metal work, forging, plumbing and electric wiring and installation.
3. Printing, including composition and press work.
4. Bookbinding.
5. Drawing, including mechanical, freehand, industrial design and the making and reading of blue prints.

In 1911 a class in architectural drawing was started; in 1913 four new activities—automobile repairing, cornice and sheet metal work, tile laying and plaster modeling, were added. The new trades added in 1914 were linotype operating and sign painting, and in 1914 an instructor in monotype operating was added. During 1916 the class in tile laying, which from the first had been very small, was discontinued.

Classification of Pupils for the Several Trades: The report of this school for the year 1913-1914 stated that "Upon entering, a pupil selects the trade he wishes to study. If there be no obvious reason for disagreeing with the pupil's choice he is permitted to follow his bent. Subsequently, it may be advisable, or necessary, for him to make a change in his work. Provision is made for such a contingency."

In March, 1917, the monthly report of this school gave the distribution of the boys for the several trade groups as follows:

Machine shop practice.....	224
Electric wiring.....	220
Architectural drawing.....	66
Printing	52
Commercial design.....	40
Mechanical drawing.....	29
Wood turning.....	10
Plumbing	9
Sheet metal.....	9
Woodwork	9
Modeling	7

Holding Power of the School: A table is given below which shows the total number of pupils registered each year in this school since it was first opened and the average daily attendance for each of these years. This table shows that in general the average daily attendance each year since the school was opened has been about half as large as the total enrollment for that year.

	Total enrollment for the year	Average daily attendance
1909-10	...	109
1910-11	821	266
1911-12	821	421
1912-13	892	427
1913-14	1047	557
1914-15	1274	662
1915-16	1279	672

There are many difficulties of organization connected with a school that has a yearly enrollment so much larger than the daily attendance unless the class sections are kept so small that individual work can be done in each class. If this cannot be done, those who enter late must either be put in classes with pupils who have been in school from the opening of the term, or new classes must be formed for their benefit.

The number of admissions and discharges month by month for the last two years is given in the table following:

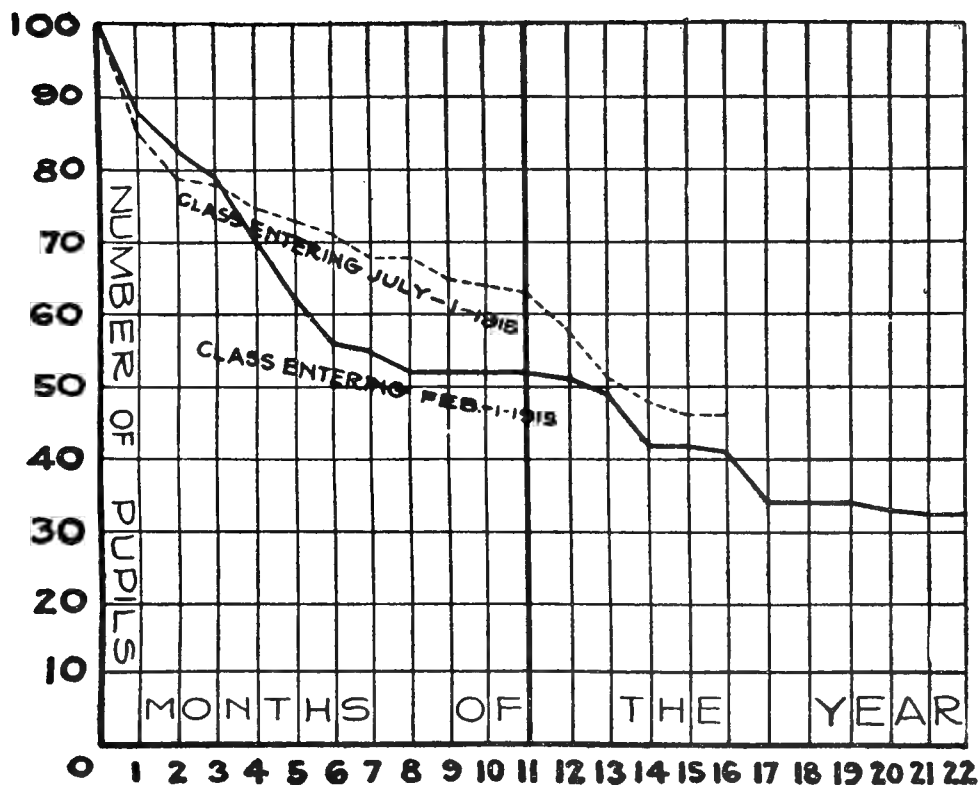
	Admis- sions	Dis- charges	Gradu- ates	Admis- sions	Dis- charges	Gradu- ates
	1915			1916		
January	38	18	0	30	63	0
February	191	40	0	204	38	2
March	40	52	6	28	70	15
April	24	69	11	13	47	13
May	18	91	2	11	41	6
June	42	52	0	10	63	15
July	89	0	0	82	25	1
September	211	55	17	73	18	4
October	53	155	5	43	52	1
November	24	91	11	20	140	23
December	7	21	2	11	34	9
Total	757	644	54	525	591	89

In order to determine just how long a boy who entered the school was likely to remain after he entered, a study was made of the attendance of the first hundred boys registered in the admission book on February 1st, 1915, and the first hundred boys registered July 1st of that same year, February and July being the months when the largest groups of pupils enter. Ninety percent of each group were elementary school graduates, five percent had finished only the sixth grade and the remaining five percent were either in the seventh or eighth grade when they entered the vocational school. As shown on Chart 6, page 65 at the end of the fourth month, 70 of the February group and 75 of the July group were still in the school. During the next two months the February group of one hundred lost fourteen as compared to a loss of only four from the July class. In each study of this kind that was made in each of the vocational schools the loss of pupils during the first summer was very much greater than during an equal number of months at any other time.

At the end of the first year 52 of the February hundred and 63 of the July hundred were still in the school. At the end of the two-year period for the February group, 32 of the hundred boys were still in school ready for placement in industry. The July group had 46 of the original number in school at the end of the 16th month.

The tendency in recent years in all four of the vocational schools has been to discourage the entrance of "That enormous class of children who leave school at fourteen years of age though still far from completing the elementary school course," and limit the attendance to those who are elementary school graduates.

CHART 6.



BOYS VOCATIONAL SCHOOL

This chart shows the enrollment month by month of two groups of one hundred pupils each who entered the Boys Vocational School February 1st, 1915, and July 1st, 1915. It reads as follows: Of the class of 100 entering February 1st, 88 remained more than one month, 83 remained more than two months, 79 remained more than three months, etc.

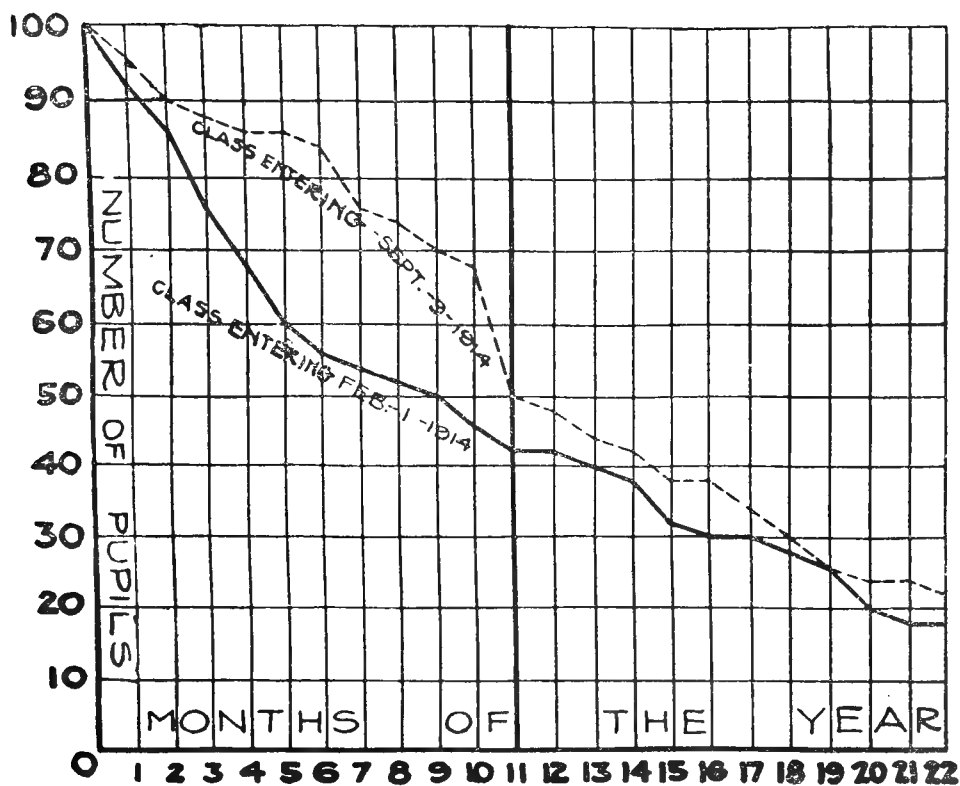
For this reason a study was made of the record of two groups of boys who entered this school after finishing the sixth grade only of the elementary school. It was necessary to go back to the year 1914 to find enough boys of this class entering in any one month to make a large enough group to study.

For the first year the sixth grade boys remained in the school about as well as the group made up of boys, 90 percent of whom were eighth grade graduates, but a much smaller number remained to the end of the two year course. The vacation period, especially for the class entering in February, marked a large falling off in attendance. Whether this was due to the fact that the work was arranged for boys who had finished the elementary school and so was too difficult for those who had only finished the sixth grade or due to other causes we have no means of knowing. Chart No. 7 on page 67 gives the record month by month for each of these groups.

Size of Classes: The Boys' Vocational School is the only one of the four day vocational schools that has not filled the position of teachers of non-vocational subjects with teachers who have been transferred from the elementary school. By a rule of the Board of Education, if elementary school teachers are transferred their hours are not increased from the five hour day of the elementary school to the seven hour day of the vocational school, but their salary is increased \$200 over the salary received in the elementary school. When the teachers transferred from the elementary school to the vocational school have been near the top of the salary schedule (and most of them have been) the short hours and high salary have forced the school to make the academic classes large in order to keep the per capita-per-hour cost within reasonable limits.

In this school the teachers of academic subjects are employed the same number of hours a day as the trade teachers and in general their classes are no larger than the shop classes. So it is possible so far as the size of the class is concerned, to have the academic instruction as individual in character as in the trade classes. Seventy-five per cent of all the classes at the time of the survey had a registration of between 18 and 22 pupils to the class. In the academic work only two classes of over 35 pupils were noted and the smallest class had 16 enrolled. The small registration in modeling, plumbing, sheet metal, woodwork and wood turning (each having less than ten pupils) has made it necessary to have many small classes in these trade courses.

CHART 7.



BOYS' VOCATIONAL SCHOOL

This chart gives the same data described above for two groups of boys who entered the Boys Vocational School, having completed the sixth grade of the elementary school. It reads as follows: Of the class of 100 entering February 1st, 1914, 92 remained more than one month, 86 remained more than two months, etc.

Courses of Study: The members of the survey staff were unable to secure any courses of study in this school either for the academic courses or the trade courses. The reason was given that the instruction was largely individual in its nature and a course of study would be a hindrance rather than a benefit. Only two of the young men teaching academic courses had had any trade training and but two had more than a year of public school teaching experience before being assigned to work in this school.

Each of the teachers, who was asked about a course of study, stated that on undertaking the work of teaching in this school he had found no course, or outline, that had been used by the previous teacher and that the outline he was following was one he had made himself. Many of the teachers interviewed expressed the need of help in organizing their teaching material so as to be of most benefit to the boys of each trade group.

In February, the superintendent in charge of vocational activities was told of the difficulties in securing these courses and on May 18th mailed the director of the survey courses of study in automobile work and gas engine mechanics, business English and industrial history including the municipal activities of the City of New York and the industries of New York City.

The Relation Between Academic and Trade Instruction: In spite of the fact that the academic classes were kept almost as small as the shop classes, only two trade courses, electric wiring and machine shop practice, enrolled enough pupils to make it possible to have only the boys of the same term of the same trade in the one class.

The program of each academic teacher is such as to require that he spend two periods each day in some one of the shops in order that he may see what the boys are actually doing in their work.

Time was not available to determine definitely just how efficiently the teachers of these mixed classes were able to carry out group instruction in such a manner as to correlate the academic work with the trade work. One science class noted was made up of first, third and fourth term boys in architectural drawing and boys from all four terms in plumbing. The first term architects were studying forces while the third and fourth term architects were determining heat calories. The first and second term plumbers were studying the action of pumps and the third and fourth term plumbers were learning the properties of acids. In

an English class made up of boys from the third and fourth term of electric wiring, the pupils spent the period copying the form for a postal money order into their note books. In another English class visited, one boy was reading aloud from a book on contracts and after each paragraph was read the class was quizzed as to its meaning. The teachers of trade mathematics have had several years of trade experience as well as teaching experience and there seemed to be a much closer correlation between the shop work and mathematics than in the teaching of any other of the subjects observed in the school.

Organization of Shop Courses: The organization of the shop courses in this school is different from that in the Murray Hill and the Brooklyn Vocational School. A brief description of the organization of the work in each department follows:

In the printing department, the boy spends the first year and a half in the composing room and the press room and a short period in the bookbinding room. At the end of that period of time, he is allowed to specialize in hand composition, press work, linotype operating, monotype operating, or stone work. The boy in this department spends twenty-three hours a week in the shop, while the boy registered in other departments spends twenty hours a week in shop work. The boy in the printing department has work in English for five periods, in drawing three periods, and in science two periods a week, while the boy in the other trade departments has work in English for three periods, in drawing six periods and in science three periods a week.

The work in the electrical department is divided into five divisions, as follows: (1) bell, communicator and burglar alarm, (2) telephone, (3) light wiring, (4) motors (dynamo and generator) and storage batteries, and (5) flash sign operating.

A boy in this department spends a term in each of the first three divisions, half a term in the fourth division and also a half term in the fifth division. First term boys spend three periods a week in the wood shop and third and fourth term boys spend two periods a week in the plumbing shop, wiping joints and splicing for lead and case work.

The boy who enters the machine department spends three-sevenths of his shop time for the first term in the machine shop, two-sevenths of his shop time in the forge shop and the remainder of his time is equally divided between the sheet metal shop and pattern making. During the second term he spends four-sevenths

of his time in the machine shop and three-sevenths of his time in the forge shop. The second year he is allowed to specialize in machine shop work or auto-machine work.

The work in the woodworking department is divided into three divisions: cabinet making, house construction and mill work. The boy spends one-third of his time in each of the three shops. The student in the pattern making department devotes his entire shop time for the two years to the work in wood turning and pattern making. The boy studying plumbing spends his entire shop time for the two years in the plumbing shop.

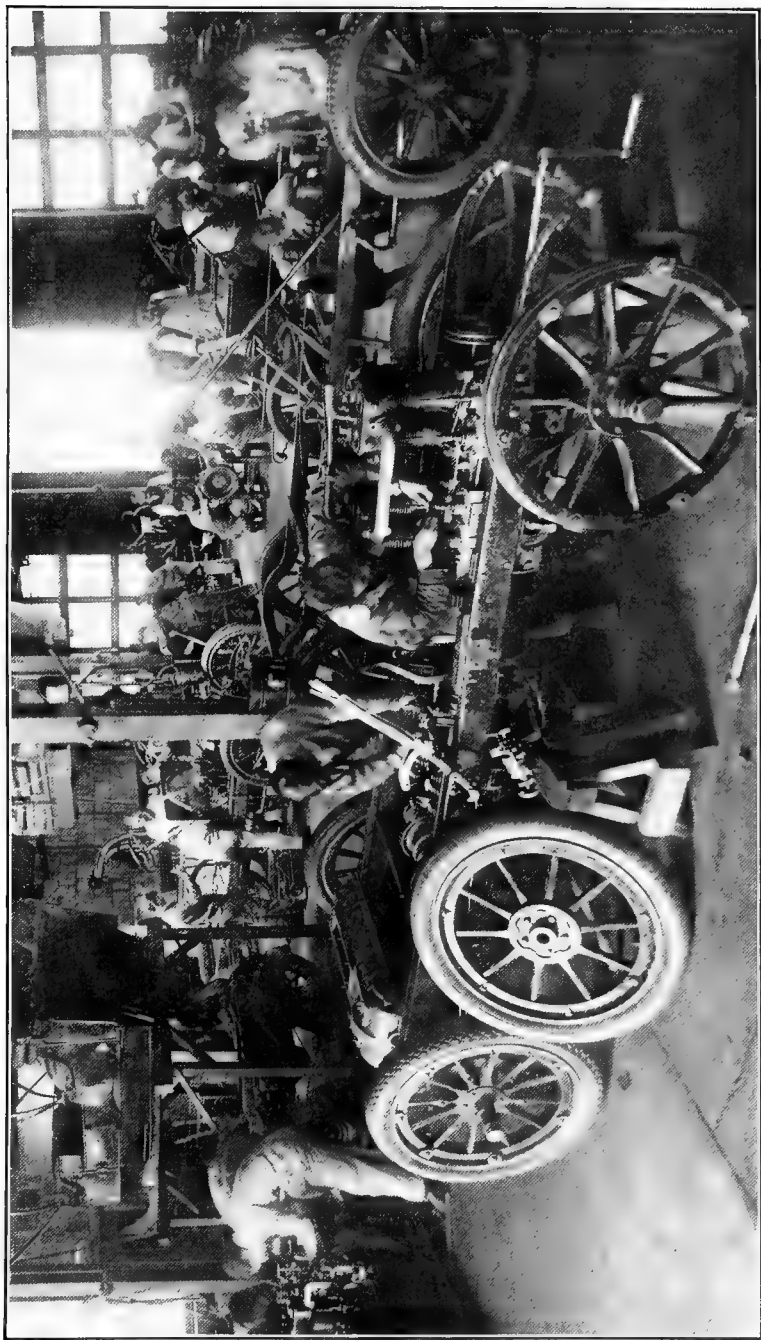
The student in the architectural drafting department gives twelve periods a week to the drawing room, two periods to clay modeling, three periods to electrical work, three periods to plumbing and four periods to woodworking, two periods to sign painting and the remainder of his time to academic work. The boy specializing in mechanical drawing spends fourteen periods a week in the drafting room and twelve periods a week in the machine shop, auto-machine shop, the sheet metal shop, the press room, and the remaining fourteen periods in academic work.

The distribution in the different trade subjects of the forty periods into which each week is divided is shown in the accompanying table:

	Printing	Electrical	Sheet Metal	Machine Shop	Plumbing	Woodwork	Pattern Making	Architectural Drawing	Mechanical Drawing
Shop Work.....	23	20	20	20	20	20	20	14	12
Drawing	3	6	6	6	6	6	6	12	14
Mathematics	3	3	3	3	3	3	3	3	3
English	5	3	3	3	3	3	3	3	3
Science	2	3	3	3	3	3	3	3	3
History	1	1	1	1	1	1	1	1	1
Physical Training...	3	3	3	3	3	3	3	3	3
Study	0	1	1	1	1	1	1	1	1

Character of the Instruction (Shop): There is a great difference in the character of the instruction in the various departments. In the printing, woodworking and sheet metal departments considerable commercial work is produced, while in the other departments practically all of the work, outside of repairs for the school and the equipment, consists of exercises.

The work of the printing department, where six shop teachers



AUTOMOBILE DEPARTMENT—VOCATIONAL SCHOOL FOR BOYS

are engaged and fifty-two boys enrolled, consists largely of printing forms, blanks and circulars for the Board of Education. The value of the product of this department amounts to about \$1,000 a month. The fourth term boys are allowed to specialize in linotype, or monotype operating. It may be noted that to allow boys of such limited composing room experience to specialize on machine composition is contrary to the established practice in the trade where boys are not allowed to work on machines until the fifth, or probationary year, and in the schools maintained by the manufacturers of type-setting machines the attendance is usually limited to those who have considerable trade experience.

Outside of the necessary electrical repairs for the school building and its equipment, the work in the electrical department consists largely of exercises. The number of pupils enrolled in this department makes it possible to secure a careful classification and grading of the pupils and permits the school to secure specially trained men to teach the different branches of the trade.

In the auto-machine shop the boys secure a very thorough training in the overhauling and repairing of many different types of cars. In the regular machine shop the work consists largely of exercises in classes that are so large that two boys are assigned to each machine or bench job. The machines are driven by alternating current motors with which it is difficult to secure a variable speed control which is desirable for this kind of work.

In the sheet metal shop the boy spends part of his time making supplies for the Board of Education and a part of his time in developing problems in sheet metal work. The correlated drawing is taught in the shop and consists of making full scale drawings for the shop projects. In the plumbing department the time is about equally divided between lead work and the installation of fixtures. The boys also spend some time in pipe fitting. The plumbing repair work in the building is done by the boys of this department.

The work in the other departments is largely individual instruction. The classes are small and the teachers can give each boy considerable attention. The drawing for the boys specializing in the different trades does not seem to be closely correlated with the shop work. In several of the trade departments, the shop men teaching the drawing necessary for the working out of the shop problems and in such cases it was much more closely corre-

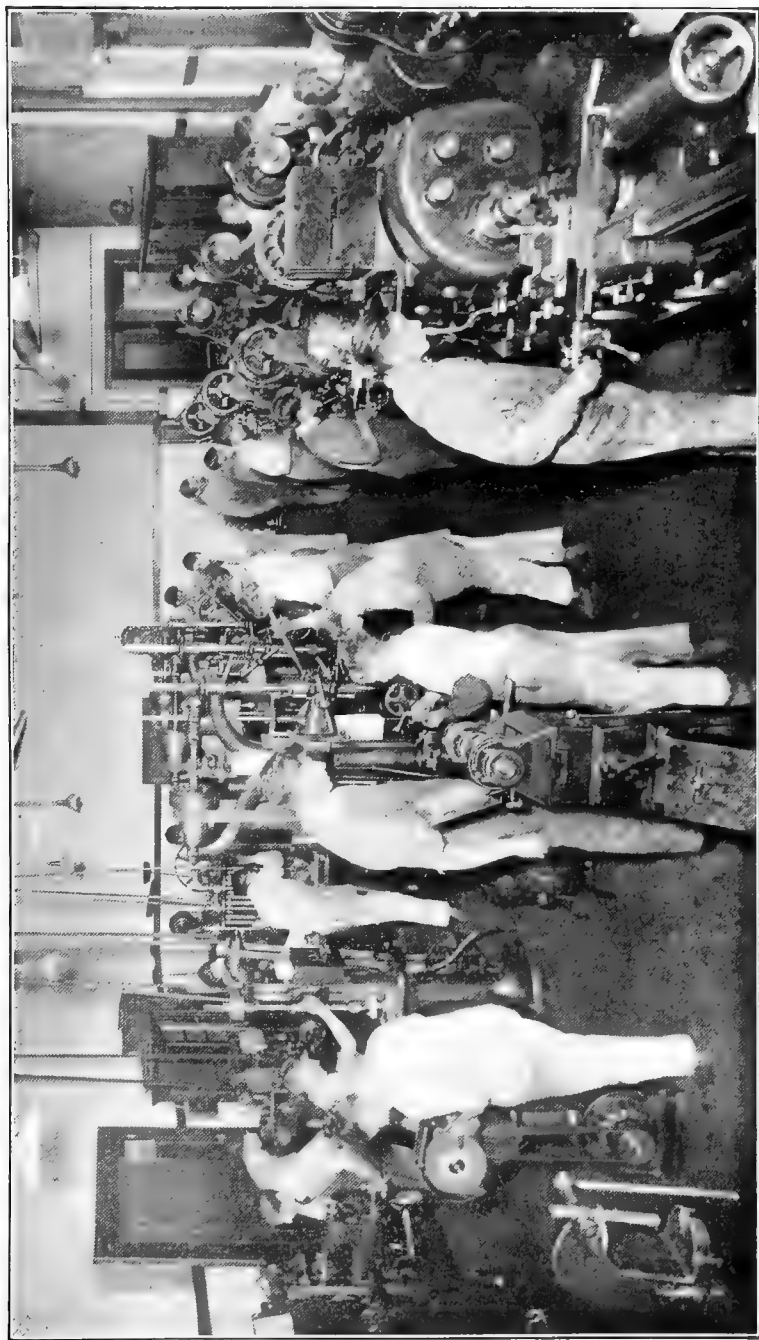
lated with the work of the trade than when the drawing was taught by the regular teachers of drafting.

The Teaching Staff: The rules of the Board of Education concerning the teachers in the vocational schools have been subjected to several changes taking place while this survey was being made. The salary schedule for regular teachers of vocational subjects in vocational schools for boys grants \$1,500 for the first year with an annual increase of \$125 until a maximum of \$2,500 is reached. Teachers assigned by the board of superintendents from the elementary school where the maximum salary is \$2,400 to teach non-vocational subjects (English, history and geography) in a vocational or trade school receive \$200 a year as additional compensation. The substitute teachers of vocational subjects in these schools are given \$5.00 a day and the substitute teachers of the non-vocational subjects receive \$0.60 an hour.

At the time of making the survey there were 17 regular teachers and 31 substitute teachers in this school. Of the 17 regular teachers, 12 were teachers of shop courses, three were teachers of trade mathematics and two taught mechanical drawing. Of these 17 regular teachers, 14 had been teaching in this school for four or more years.

This continuity of service is not found, however, among the substitute teachers who make up two-thirds of the teaching force. In the printing shop nine different men served as substitute teachers during the two years of 1915 and 1916. Only one of these men taught all of both years. There were ten substitute teachers of electric wiring during the same two years, only three of whom taught the two years. There were four substitute teachers of tile laying during these two years, three different men in 1916 with terms of service ranging from a single month to six months, although there were no pupils reported for this trade any month of the entire year. During the year of 1916 two substitute teachers were employed to teach sign painting (one from March to December, the other from May to December), although the monthly report of the school gave no pupils registered for this trade for any one of these months.

English is taught by substitute teachers who have changed so frequently that of the seven different men employed since January, 1915, to teach this subject only two have been there continuously for the two years. Eight different men have acted



CLASS IN MACHINE SHOP—VOCATIONAL SCHOOL FOR BOYS

as substitute teachers of drawing, not one remaining the full two years. Only one of the substitute science teachers and but one of the teachers of history was in the school two years ago.

The teachers of academic subjects as well as the teachers of trade subjects in this school are employed seven hours a day and eleven months a year.

Building: The Boys' Vocational School is located in the largest building devoted exclusively to vocational work in the city. The building, originally a 48-room high school annex, is a six-story brick and stone structure. The students have made many alterations in the building, such as removing partitions, changing the lighting fixtures, laying floors, as well as plastering and painting. As a result of these alterations, the shops with one or two exceptions, are located in large, well lighted and well ventilated rooms.

The boys and teachers of this school also planned and erected a large fireproof auto-machine shop on an adjoining vacant lot. This shop is about 70 x 80 feet and is large enough to house fifteen automobiles and the necessary machines for repair work.

Equipment: The Board of Education has expended \$63,797 for the equipment in this school. It is impossible to give in this limited report a list of all the equipment, but the following brief statement of the types of machines and tools provided for the printing department, automobile shop and the machine shop will give a general idea of its scope.

In the printing department are several job presses, a cylinder press, power paper cutter, six linotypes, one monotype and the necessary composing room furniture.

In the automobile shop are thirteen foreign and domestic automobiles of various types, two lathes and the necessary bench and hand tools.

The equipment in the machine shop consists of nine engine lathes, three large drill presses, four spindle drills, one hand milling machine, one plane milling machine, one planer, two shapers, one universal grinder, three speed lathes and tool grinders and the necessary tool and bench equipment. These machines are driven by alternating current motors with which it is difficult to secure variable speed control.

Records and Reports: The usual school records in regard to attendance and progress of the pupils are kept in this school.

Each teacher of the school is assigned a certain number of pupils with whose home conditions he becomes familiar and no boy who leaves the school is marked discharged until his teacher reports upon why he is leaving and whether he intends to return. Since it takes considerable time for the teachers to secure this information, (all of which must be done outside of school hours and without any extra compensation) many boys are kept on the register for days and weeks after they have left school.

As was shown in the section dealing with the holding power of the school, some of the pupils who entered in February and July left the school the same month they entered. Month by month others dropped out while some remained to the end of the two-year course. Of these four groups presented graphically in Charts No. 6 and No. 7, the attendance record of the first fifty of each group that left school was checked to determine the difference between the last day each boy was in school and the date that he was discharged and his name taken off the register.

The record for one of these groups of fifty boys is tabulated below:

Total number of months of actual attendance of the 50 boys.....	172
Total number of months on the register for the 50 boys.....	301
Average number of months of actual attendance for each boy.....	3.4
Average number of months each boy's name was on the register.....	6
Discharged in less than one month after leaving.....	3
Discharged between one and two months after leaving.....	7
Discharged between two and three months after leaving.....	23
Discharged between three and four months after leaving.....	7
Discharged between four and five months after leaving.....	6
Discharged between five and six months after leaving.....	2
Discharged between six and seven months after leaving.....	2

Seven of the fifty boys did not return to the school at all after the first day in which they enrolled. It took two months to get three of these names off of the register during which time they were counted as members of the school. A month later another of the seven was marked discharged, two more were discharged the next month and one was discharged five months after he had left the school. The most extreme case found in any one of the four groups studied was that of a boy who was marked present on his report card on 18 days and marked absent on 332 days. Although he was actually in school less than an average month he was counted as a member of the school for a year and a half.

In the other vocational schools the pupils' names were kept on the register not more than a few days after they left school.

Analysis of Costs: There are so many different methods of determining school costs because of the many different factors to be considered that it is difficult to make any statement regarding the costs of instruction that is not open to criticism. The financial report of the Board of Education shows the annual per capita costs for the past five years of the Boys' Vocational School to be as given in the table below:

INSTRUCTION COSTS—BOYS' VOCATIONAL SCHOOL

Year	Total Cost	Average Daily Attendance	Cost Per Capita	Net Cost Per Capita
1911	\$31,403.08	327	96.03	90.81
1912	36,196.67	416	87.01	76.91
1913	41,079.98	475	86.48	73.57
1914	62,780.19	608	103.25	80.15
1915	70,001.84	676	103.55	72.68

The difference between the cost per capita and the net cost per capita is due to the allowance by valuation that is made for the manufactured product that is used within the school system.

While the gross cost per capita has increased \$17.07 above what it was the year the cost was the lowest, the net per capita cost has decreased \$18.13 from that of the year it was the highest. The annual per capita cost for the high schools of New York City for the year 1915 was \$100.68.

The annual financial report also gives the cost on what is called a per capita-per-hour basis which is the average cost for each of the aggregate hours of instruction in the school. The gross and net per capita-per-hour cost for this school for the past five years, compared with the per capita-per-hour cost for the elementary schools for the same period is given in the following table:

Year	Gross Per Capita-Per Hour	Net Cost Per Capita-Per Hour	Net Cost Per Capita-Per Hour for Elementary School
1911	.066	.062	.037
1912	.057	.051	.043
1913	.057	.047	.044
1914	.069	.053	.046
1915	.071	.05	.045

The net per capita-per-hour costs are susceptible of comparison with the other schools and with other types of educational activities, which is not true of the annual per capita cost.

In order to show the relation between the over head expense, the cost of instruction in the non-vocational subjects and in the trade subjects, a table is given below showing these costs distributed on a per capita-per-hour basis. It will be noted that the cost of the non-vocational work increased greatly each year. This was due to the fact that the associate superintendent at present in charge of vocational activities desired that the academic instruction in this school should be emphasized more strongly than it had been before he took charge of the vocational work.

PER CAPITA-PER-HOUR CASH DISTRIBUTION FOR
SALARIES ONLY

Year	Other Than Teachers	Teachers of Non- vocational Subjects	Teachers of Vocational Subjects	Total Per-Capita- Per Hour for Salaries
1914	.0057	.0034	.0401	.0492
1915	.005	.0051	.0492	.0593
1916	.0057	.0129	.0495	.0681

The data are not available from which it would be possible to make an accurate distribution of the costs of the various items which go to make up the annual per capita costs of \$103.55 but in round numbers the chief items would be about as follows: trade instruction, \$57.00; academic instruction, \$20.00; supplies, \$17.00; supervision of the principal, \$6.00. This leaves \$3.55 not covered by these five items.

There is also much difference in the cost for the several trades in which instruction is offered. Woodwork, which includes carpentry, pattern making and the use of wood milling machinery, has had an average monthly register since last July of 25 boys. The cost for salaries of the three trade teachers of woodwork is \$5,875. Printing, including bookbinding, linotype and monotype instruction as well as composition and press work, has had since last July an average of 53 boys enrolled in the department. The cost for salaries of the six teachers who give all of their time to the boys registered for printing is \$8,000. The average registration in plumbing was 14 boys. Nine boys on the average were registered for the course in modeling, ten for sheet metal and none at all for sign painting and yet a trade teacher is employed

for each of these groups. The annual per capita cost is kept as low as it is (1) because two trades, electric wiring and machine shop practice, have an average monthly register of over 200 pupils in each trade and the lower cost of trade instruction in these two trades brings down the average for them all, and (2) because some of the trade teachers, as in woodwork, plumbing, sheet metal, sign painting, and modeling devote part of their time to teaching boys from other trade groups.

SUMMARY:

1. Only architectural drawing, electric wiring, machine shop practice and commercial design register more than thirty pupils for each course. Modeling, plumbing and sheet metal were taught with less than a dozen pupils for each trade.
2. The Boys' Vocational School holds a larger percentage of the pupils to the end of the two-year course than is the case in the other vocational schools.
3. Neither the shop classes nor the academic classes were too large for efficient trade teaching.
4. Few of the teachers were following a definite course of study and as a rule a new teacher made up his own course with little help from his superiors or his predecessors.
5. Two-thirds of the teachers in the school were on the substitute list at \$5.00 a day. The substitute teachers in the school both of trade and academic subjects changed so frequently that less than 20 per cent. remained as long as two years, and 40 per cent. remained less than six months.
6. With this constant change of teachers there was little correlation between the academic and trade subjects.
7. The daily register of pupils was much larger than the attendance as pupils' names were kept on the records two to three months after they had left the school.
8. The small enrollment in over half of the trade courses offered has greatly increased the cost of trade instruction.

MURRAY HILL VOCATIONAL SCHOOL

Location: The Murray Hill Vocational School, which was opened March 31, 1914, is located on 37th and 38th streets. The school is within a few minutes' walk of the subway, the 2nd Avenue elevated and the 3rd Avenue elevated.

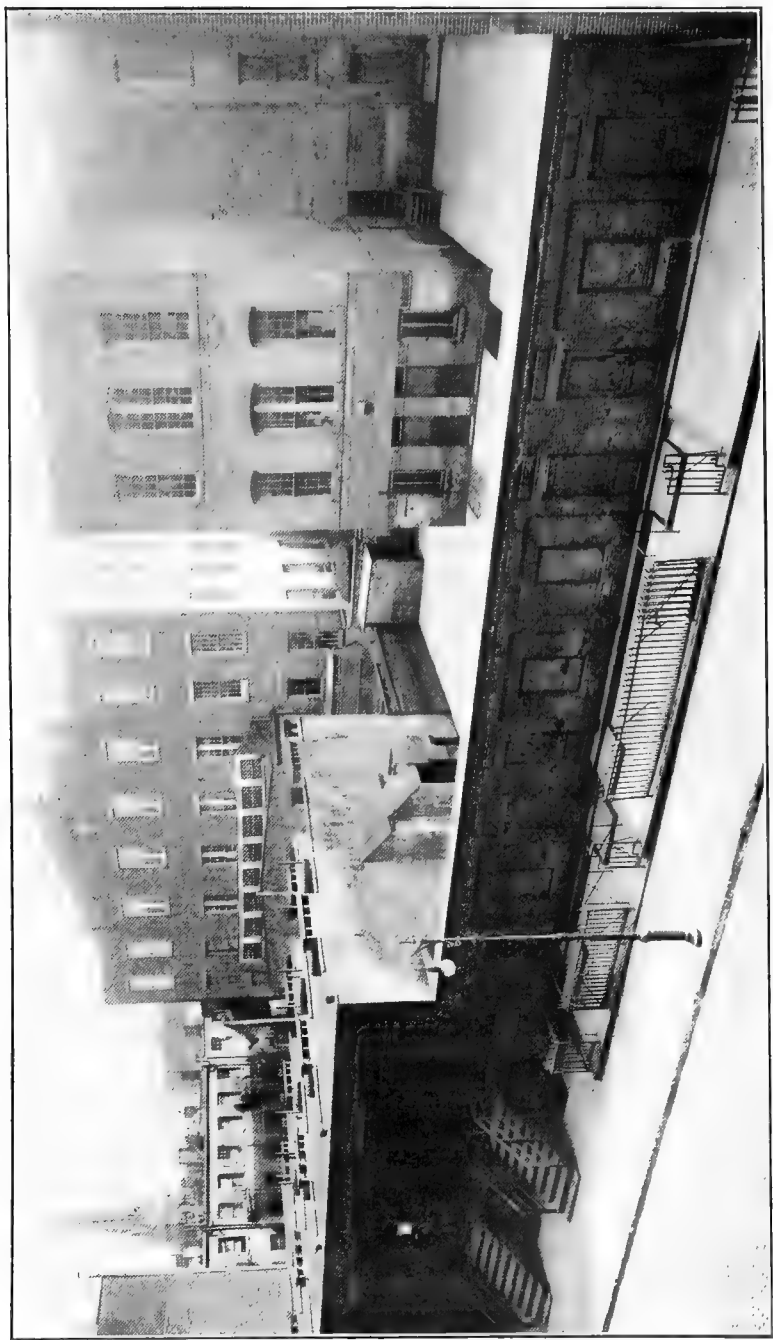
Classification of Pupils for the Several Trades: In this school the choice of the boy is almost always the deciding factor as to the trade to be studied. A boy who enters a vocational school

usually does so because he has made up his mind that he wants to learn a certain trade, and if there is room in that department, he is given a chance to see how closely anticipation and realization are correlated. If he shows "exceptional proficiency in the first trade chosen, he is permitted to confine his work to that trade," otherwise he selects different trades from different distinct trade groups until he finds the trade where he can do the most satisfactory work.

The trade subjects offered in this school as given in the 1914-15 annual report and the distribution of the students in the several trade subjects for the month of March, 1917, as stated in the principal's monthly report to the superintendent, are given in the table below:

1. Wood work—14	4. Drafting—62
1. Joinery	1. Mechanical drawing—58
2. Cabinet making and finishing	2. Architectural drawing—4
3. House carpentry	3. Making and reading blue prints
2. Metal Work—99	5. Advertising—9
1. Plumbing and gas fitting—34	1. Sign painting—9
2. Automobile repair—65	2. Display and show cards
3. Electrical work—103	6. Printing—39
1. Electric wiring installation—103	1. Composition
2. Instrument making	2. Imposition
3. Electrical signs	3. Press work
4. Electro-plating	4. Proofreading

Holding Power of the School: The school report for the year 1914-1915 shows an average daily register for the year of 209 pupils, an average daily attendance of 180, a percentage of attendance of 86. For the year 1915-1916, the corresponding figures were 237 register, 217 attendance, or a percentage of 91.5. It is possible to conceive of a school with an enrollment of one hundred pupils that discharged five pupils and admits five new pupils each school day. At the end of the month, although all of the original hundred pupils had left, the school would have an average daily attendance of one hundred and consequently the school could show an attendance record of one hundred per cent. It is also possible to conceive a school with an enrollment of one hundred pupils, each one of the hundred attending every day for the month. This school that lost no pupils and gained none would also have an attendance record of one hundred per cent. At the end of a school year of ten months our first school would have



MURRAY HILL VOCATIONAL SCHOOLS—BUILDINGS AT LEFT SHOW POOR HOUSING FACILITIES PROVIDED FOR THIS SCHOOL

registered one thousand different pupils each for only a month's instruction, although the attendance record would still be perfect. The second school that kept its original hundred in daily attendance for a year would have given a year's instruction to each one of the hundred while keeping its attendance record at one hundred per cent. In other words, the holding power of the school cannot be determined simply by figures showing percentage of attendance. The constant procession of boys entering and leaving this school is clearly shown by the number of admissions and discharges month by month and is given in the table below:

	1915		1916	
	Admissions	Discharges	Admissions	Discharges
January	11	10	2	6
February	136	25	102	24
March	22	21	11	23
April	6	25	5	35
May	11	23	24	32
June	6	63*	6	24
July	81	28	52	29
September	44	54	44	19
October	17	31	39	52
November	9	15	16	17
December	2	3	2	16
TOTAL	345	298	303	277

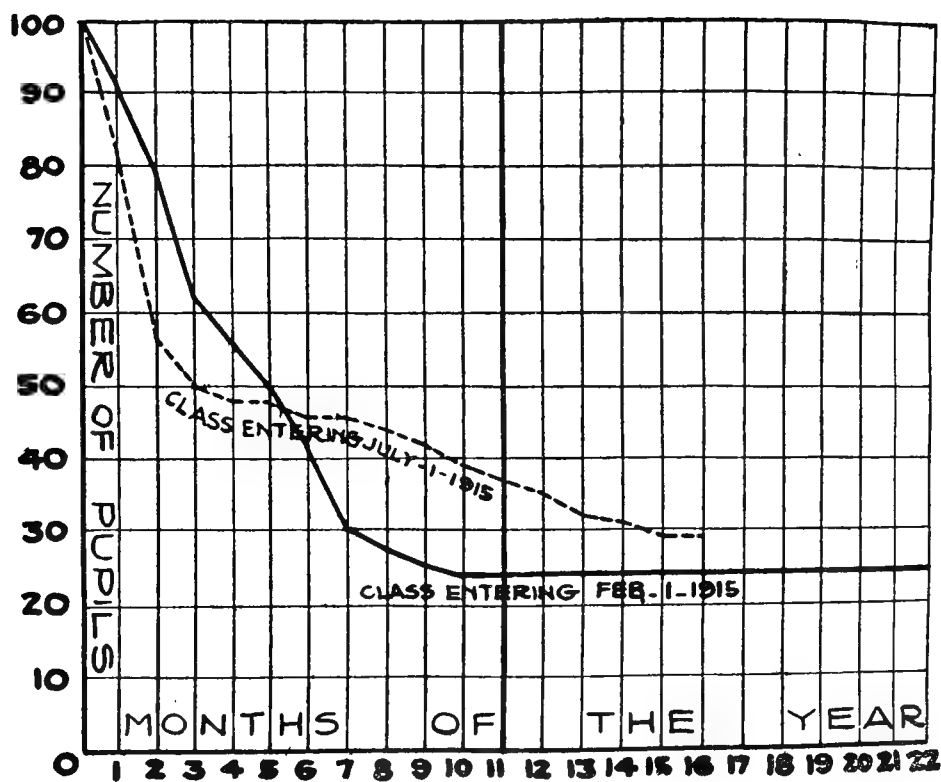
The holding power of a school may be determined by taking the records of each pupil who enrolled as a student and finding out how long he attended or where this is impractical because of the large number of pupils enrolled, by taking a representative group of pupils who enter the school and seeing how long each one of the group remains. Both methods were used in this school. The Murray Hill School receives the largest increases during the months of February and July, respectively. The attendance records of the first hundred pupils registered in the admission book for February, 1915, and also for July, 1915, were tabulated. Of the July group half of the hundred had left school at the end of the first three months, while of the February group one-half were gone at the end of June and two-thirds of them had quit before the end of July.

Chart No. 8 shows the number remaining each month out of the first hundred pupils who entered the school for the months

*58 pupils sent to the Brooklyn Vocational School.

46 graduates included in discharges up to July, 1916.

CHART 8



MURRAY HILL VOCATIONAL SCHOOL

This chart shows the enrollment month by month of groups of one hundred pupils each that entered this school in February and July, 1915. It reads as follows: Of the class entering July 1, 1915, 82 remained more than one month, 57 remained more than two months.

studied. The total enrollment of the Murray Hill Vocational School from the time it was opened under the control of the Board of Education to February 1, 1915, was 396 pupils. Of this number 58 were registered as members of the Brooklyn Vocational School and were transferred to that school when it was organized in June, 1915. This leaves 338 pupils as the register of the Murray Hill School up to February 1, 1915. Of this number 89 completed the course and graduated some time between February 1, 1915, and February 1, 1917, or 26.3 per cent. It is interesting to note that there is only about two per cent. difference between the records of the two groups of one hundred pupils and the record of all the pupils who entered the school.

Attendance of Pupils: A study of the attendance of these same two groups of pupils shows that one-third of the pupils who remained more than a month in the school had a perfect record for attendance. An additional third averaged 17 or more days attendance for each month they were in the school, while the third that were poorest in attendance were present about two-thirds of the time.

Progress of Pupils: Regularity of attendance and a correct attitude toward his work in the shop and class room are the chief standards set up by the school for measuring the progress of the pupils. Since the seven-hour day provides time for study, recitation and shop work and the teachers of the academic subjects are all skilled, experienced teachers there is little need for formal examinations to determine how well a pupil is doing his work.

Size of Classes: The daily programs which the teachers of this school made out for the survey staff show a wide range in the size of the classes. The smallest was in sign painting where for eleven periods a week an instructor gave lessons to one pupil, the only member of the class. To give this pupil instruction for three hours a day, the cost for the teacher's salary alone is a little over \$8.50 a week.

The largest classes were in non-vocational subjects. An English class of 50 pupils, a geography class of 47, a science class of 46 were the largest sections noted in the school. The classes in mechanical drawing ranged in size from 7 pupils to 37; in electric wiring from 10 to 39 pupils; in English from 10 to 50 pupils; mathematics from 11 to 42; sign painting from 1 to 18;

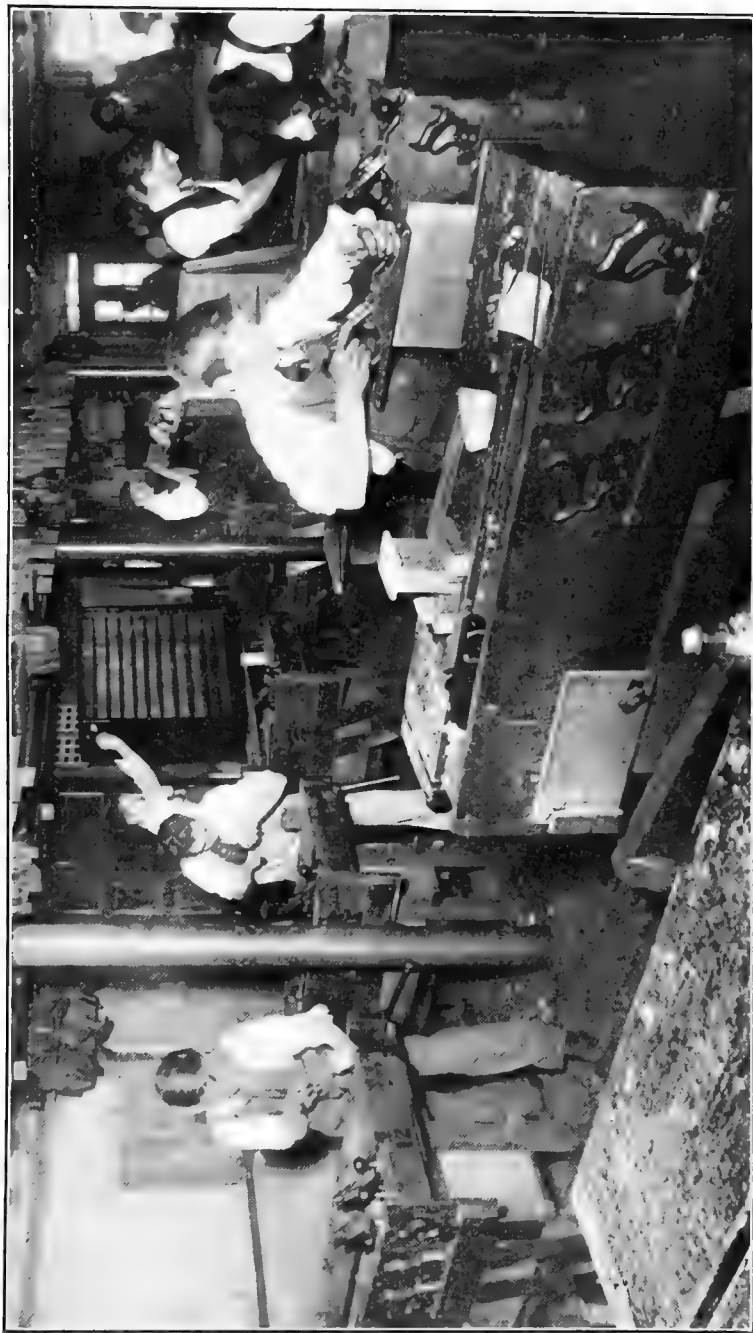
printing from 9 to 17. The greatest difference in the size of the several sections is due to the great difference in the number of boys registered for each trade subject. While the school had an average daily register in 1915-1916 of 106 pupils in electric wiring, the average daily register for the year in sign painting was only 13 and in woodwork only 8. These small trade groups are further divided between the four terms of the course and also divided between shop courses and academic courses. To care for these small groups, without prohibitive cost, either (1) the boys of one trade must be grouped together, irrespective of whether some are just beginning the course and others are just finishing it, or (2) the boys must be classified according to the time they have been in school, thus putting the boys studying several different trades into the same class, or (3) boys of different terms and of different trades are all put together in one section. All of these combinations are found in some of the academic classes.

Course of Study: The members of the survey staff realize that conclusions in regard to teaching methods and the relative value of the subject matter taught cannot be determined by simply visiting the class rooms and trade shops a limited number of times. For this reason an earnest effort was made not only to secure from each teacher the course of study he was following but also to discuss with him his methods and the results he was securing.

The principal refused to give out copies of the courses of study the reason given being that the school had been so recently established that courses were in a state of transition. Some months later the superintendent in charge of vocational activities sent courses of study in all courses except plumbing, wood-working, printing, automobile repairing and science.

Relation Between Academic and Trade Instruction: English, history and geography are considered non-vocational subjects and the courses in these three subjects are general in their nature. Geography and history are taught from an industrial point of view and the aim of the work in English is to give facility in the use of both the spoken and the written language. The literature required to be read included Stevenson's "Treasure Island," Franklin's Autobiography, Irving's "Sketch Book," Poe's "Tales and Poems," Lamb's "Tales," Shakespeare's "As You Like It."

The time allowance for trade mathematics is the same for all trade subjects. Since the amount of mathematics required in



WOODWORKING DEPARTMENT—MURRAY HILL VOCATIONAL SCHOOL

the trade for printers, plumbers and sign painters is slight as compared to the amount of mathematics the electrician and machinist must know, the course for the first group of trade workers is largely general mathematics in order to make it extend over the time devoted to this subject. In general, however, it may be stated the opinion of the survey staff that the trade mathematics is as closely correlated with each trade subject as is possible under such adverse conditions as are necessary by trying to give the boys in all trades the same amount of mathematics and the further difficulty of having boys of different terms and different trades in the same class. The difficulties confronting the teacher of trade mathematics also apply to the teacher in science.

The course of study, giving the amount of time in hours per week that are allotted to each subject taught in the school and showing the amount of time devoted to the trade instruction compared to the amount of time devoted to the academic instruction, is shown in the table which was taken from the 1914-15 annual report of this school.

COURSE OF STUDY FOR TWO YEARS (FOUR TERMS)

SUBJECT	HOURS PER WEEK				Total Hours
	First Term	Second Term	Third Term	Fourth Term	
English	3	3	3	4	13
Drawing, Mechanical and Freehand.....	4	4	4	4	16
Trade Mathematics	2	2	3	3	10
History and Civics.....	2	2	..	..	4
Industrial Geography.....	2	..	..	..	2
Applied Science.....	..	2	3	2	7
Physical Training and Hygiene.....	1	1	1	1	4
Assembly—Music	1	1	1	1	4
Study: 2 hours—English					
2 hours—Mathematics					
1 hour—Use of Library.....	5	5	5	5	20
Total hours academic work per week.....	20	20	20	20	..
Total hours trade work per week.....	15	15	15	15	..
Total hours of work per week.....	35	35	35	35	..

Trade Instruction: The very poor equipment and rooms provided and the fact that a large percentage of the boys leave so soon after they enter the school necessarily influences the character of the trade instruction in the school.

The boys in the wood shop work on projects to take home

and pieces of furniture for the school. The instructor states that he attempts to give the boys a thorough training in hand tool work to prepare them to go into cabinet and furniture shops as bench workers. As was stated in describing the equipment, there is no machinery in this shop and the room is so small that the work is limited to the usual manual training exercises. The cabinet drafting is carried on in the shop room. The instructor usually makes the designs for the large pieces and the boys work from the full scale drawings.

In the plumbing department instruction is given in lead work and installation of fixtures. The space provided for this shop is so limited that the instructor has to work out many of the installation problems in an open court adjoining the shop. The out of door work depends to a large degree upon favorable weather conditions.

Very little attempt is made to work upon the equipment needed for the school, although the school needs many things that could be made in the shops and would furnish "live" problems for the boys to develop. For example—there is a need for a number of mechanical drawing tables for the drafting departments, where the work is greatly handicapped by the lack of adequate equipment.

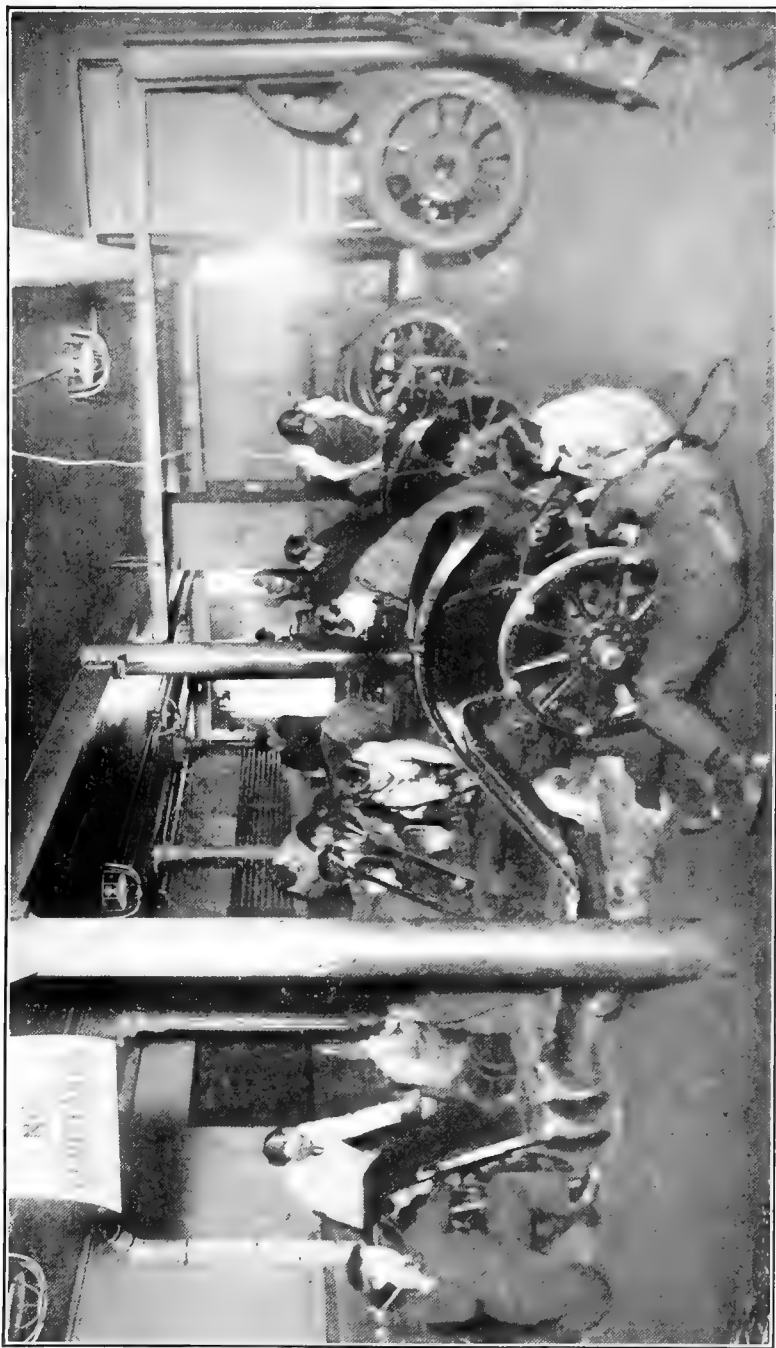
The trade drawing for the boys specializing in trade work is largely general in its nature and is not definitely related to the shop work. Most of the drawing necessary to work out the shop problems is taught by the trade teachers. The following statement is taken from the course of study in mechanical and free-hand drawing for the Murray Hill and Brooklyn Vocational Schools:

"Pupils are taught the use of T-squares, triangles, scales, instruments, etc., the general principles of mechanical drawing are derived through the following series of exercises:

"Working drawings; two views of series of prisms, pyramids and cylinders, showing various modifications; working drawings of rectangular blocks; three views. Simple solids and elementary geometrical problems. This work is followed by exercises in lettering, dimensioning and conventional hatchings, after which a brief course in development is given involving the forms previously drawn.

"The freehand drawing work consists of the principles of perspective, proportion, and the technique of sketching.

The foregoing fundamental principles are taught to the students of all trades. Differentiation only takes place after these principles have been thoroughly mastered."



AUTOMOBILE DEPARTMENT—MURRAY HILL VOCATIONAL SCHOOL

Mechanical and freehand drawing is done chiefly from models from which dimensioned sketches are made. Mechanical drawings are then made from these sketches, all necessary dimensions being shown. Perspective sketches are also made of these same objects. To gain practice in interpretation of Patent Office drawings, working drawings are made from perspectives. Inking in and tracing are included in the above.

The practical models mentioned under the different trade departments are distributed among the type problems. These models illustrate the general principles. They are not grouped for use at the end of the course. They have been arranged so for convenience only.

The practical models mentioned under the electrical and wood-work departments follow:

Electric Wiring:

Wiring Diagrams
 Porcelain Insulator
 Fuse Plug
 Battery
 Binding Post
 Floor Push
 One-Point Switch
 Conventional Threads
 Flat Push Button Plate
 Strap Key
 Annunciator
 Knife Switch
 Lightning Connector
 Buzzer
 Telephone (general drawing
 and details)
 Automatic Drop
 Bell (general drawings and
 details)
 Standard Writing Symbols
 Plan Reading
 Layout of Shop Problem

Woodworking:

Principal joints used in wood
 work taken in progressive
 order
 Drawings of wood working
 tools and details of furni-
 ture such as:
 Book Rack
 Tabouret
 Umbrella Stand
 Foot Stool
 Dining Room Chair
 (straight back)
 Library Table
 Morris Chair
 Rocker
 China Cabinet
 Dressing Table
 Writing Table
 Desk
 Plan Reading
 Layouts of Shop Problems
 Architectural Perspective

The Teaching Staff: The teaching staff is composed of 14 teachers for full time and one teacher of physical education for half time. Of these the teachers of geography, history, mathematics, English and one of the two teachers of mechanical drawing are regular teachers and the others are on the substitute list.

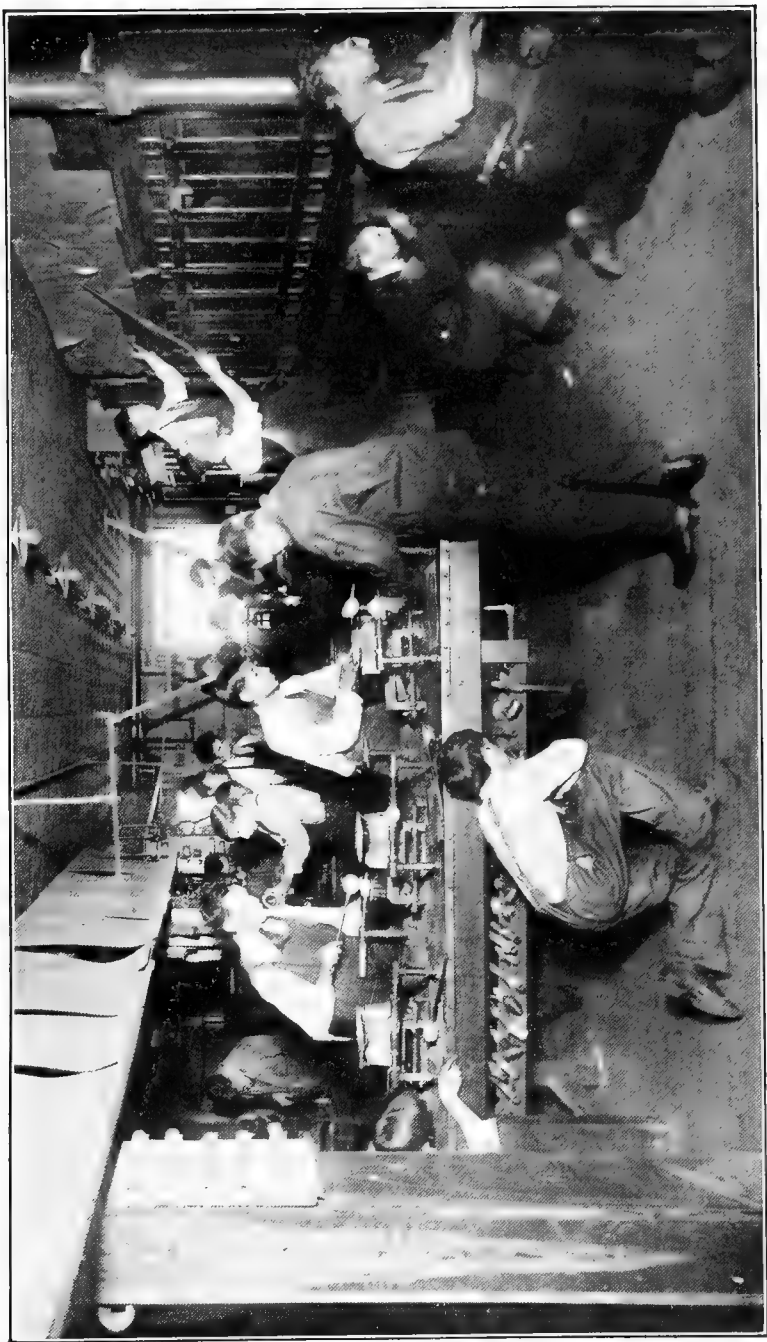
The teachers of the first four subjects mentioned are all col-

lege graduates and each has done considerable post graduate work. They have had several years' experience in elementary school teaching and were selected and transferred to this school when it was first established because of their ability to teach as shown by their previous work. Each one of the teachers of the academic subjects has had some trade training.

There has been little change in the corps of regular teachers since the opening of the school. Three of the five teachers of academic subjects are receiving the maximum salary paid elementary school teachers, \$2,400, plus an additional \$200 which, under the rules of the Board of Education, is granted to elementary school teachers transferred to teach in vocational schools. For teachers so transferred, there is no increase in the hours nor lengthening of the school years over what was required in the elementary school. This means that the work of the teacher of academic subjects is so arranged that he either has the privilege of coming to school two hours later than is required of the trade teacher, or he is permitted to leave two hours before the trade teacher finishes his day's work.

Trade Teachers: When this school was first established the teachers of trade subjects were selected from the substitute list and at the time of the survey were still substitutes and were teaching seven hours a day for a salary of \$5.00 a day. The academic teachers, who, in some cases, receive almost three times the salary of the trade teachers, teach 100 hours a month, while the trade teachers must put in 140 hours a month. In other words, the teacher of a trade subject, as printing, plumbing, electric wiring, etc., receives 71 cents an hour for teaching a shop class, while the teacher of history, science or English receives \$2.60 an hour. The trade teachers were selected largely by the principal of the school. His method has been to find a man in the trade whom he considered would make a good teacher and persuade him to try the examination given to substitute trade teachers. If the man was successful in securing a substitute license he was given a position in the school.

Buildings: The quarters provided for this school are the most unsatisfactory for vocational work of any found in the city of New York, and it is doubted that any equally unsatisfactory exist elsewhere in the state. The school plant is made up of a number of old buildings, a four-story elementary school structure facing



CLASS IN PLUMBING—MURRAY HILL VOCATIONAL SCHOOL

on 37th street, an annex, midway between 37th and 38th, and a number of old brick houses facing on 38th street. A vocational school requires large, well lighted shops with floors capable of sustaining the weight of heavy machinery. In no respect does this building meet these requirements as the rooms are small, poorly lighted and poorly ventilated and the floors are not strong enough to sustain the weight of heavy equipment. Several of the shops located in the basement are so poorly lighted that it is necessary to use artificial light. The ceilings in these basement shops are low and the ventilation is so poor that the pupils have to work in an atmosphere that is dangerous to their health. In the plumbing shop, for example, when the pupils are working with lead the fumes do not have a chance to escape properly and thus the health of the pupils and teachers is endangered. The Board of Education has recommended that this building be remodeled.

Equipment: The total investment in equipment in this school would not be sufficient to provide for one good vocational wood-working shop. Many villages and small cities in the state provide much better equipment. The difficulties of accomplishing satisfactory work with the facilities provided in this school, are evident.

The woodworking shop which is located in a low basement is so small that there is no space for the installation of machinery or the working out of problems in house framing, stair building or the construction of large pieces of cabinet work. The equipment consists of fifteen small manual training benches, fifteen sets of hand tools, a few special tools, clamps and glue pots.

The print shop, which is also located in a dark basement room, is the best equipped shop in the school. This equipment consists of fifteen cases, two small job presses, one automatic job press, a paper cutter, imposing stone, stitcher and other small furniture.

The drawing rooms are also small and poorly lighted. In one of them regular class room desks are used, the other has freehand drawing tables.

Records and Reports: The school records of each boy who enrolls in the school are full and complete up to the time he leaves to go to work. There is a separate folder for each pupil in which is kept his complete school history. His attendance, communications with and from his parents, the reports of his teachers are all filed in the one place. In addition a complete card catalog system with numerous cross references is kept up to date and

used as a means of training the fourth term boys in office practice.

The records of the boys after they have left school is far from complete and little is known of what has become of the boys who failed to complete the course which is about three-fourths of those who have enrolled.

Analysis of Costs: The financial report of the Board of Education shows that the cost per capita, based on daily average attendance for the year 1915, was \$141.35. This is only exceeded by the cost for the training schools where the per capita cost for the same year was \$160.38. The per capita cost for the high schools was \$100.68. This same report also gives the per capita-per-hour cost. For the Murray Hill Vocational School this per capita-per-hour cost was 9.6 cents; for the training schools 16.8 and for the high schools 10.7 cents.

To give the per capita-per-hour cost is a much more accurate method than to give the per capita-per-year cost, but a further analysis of the above costs is enlightening.

The table below shows the relation between the overhead expense and the cost of instruction in the non-vocational subjects and in the trade subjects. The per capita-per-hour basis of distribution makes it possible to compare the three boys vocational schools.

Year	Other Than Teachers	Teachers of Non-Vocational Subjects	Teachers of Vocational Subjects	Total per Capita per Hour for Salaries
1915.....	.0167	.0280	.0379	.0826
1916.....	.0154	.0268	.0374	.0796

As near as can be determined without consulting the data which are not easily secured, the distribution of the annual per capita cost \$141.35, would be about as follows: Supplies \$24, supervision of the principal \$11, academic instruction \$55, trade instruction \$45, leaving \$6.35 not included in these four items.

Although the average cost for all the trades taught is about \$45 for trade instruction, there is much difference in the cost for the several trades in which instruction is offered. Electric wiring that is taught to large sections of from 19 to 34 boys in a section, costs but \$22 per capita-per-year for trade instruction, and auto repairing costs \$26. At the other end of the scale are woodwork where less than a dozen pupils are registered and sign painting where a trade teacher devotes six-sevenths of his time to six pupils.



CLASS IN PLUMBING—MURRAY HILL VOCATIONAL SCHOOL

The limited shop facilities for the plumbing department make it necessary to carry on the installation work in court adjoining shop.

SUMMARY:

1. The school records for attendance show that the school does not hold its pupils. Half of the pupils who enter the school remain less than five months and only a third of the pupils remain as long as a year.
2. The academic classes are excessively large and made up of pupils from several trades and different terms in the school. Because of their mixed character and size, correlation with the shop work is practically impossible.
3. The equipment in the school is so poor and the facilities for trade instruction are so inadequate as perhaps to account in part for the large pupil mortality in this school. It would be impossible to give some of the trade courses offered, even if there were boys registered for the course.
4. The shop instruction is largely exercise work and little attempt is made to work out practical constructive problems.
5. The academic teachers who were transferred from the elementary schools have a five-hour day and receive \$2,600 for a year of ten months. The trade teachers from the opening of the school until March, 1917, were on a substitute teacher basis and received \$5 for a seven-hour day. The trade teachers have a year of eleven months.
6. The building in which this school is conducted is in every way unsatisfactory for vocational school work. The shops are small, poorly lighted and furnished with almost no equipment that meets trade standards.
7. No record is kept of the boys after they have left the school if they leave without completing the course. This means that no record is kept of almost three-fourths of the boys who have been in the school.
8. Trade instruction in woodworking and sign painting, because of the small enrollment in each, is more than twice as expensive per capita as for the other trades taught in the school.

BROOKLYN VOCATIONAL SCHOOL FOR BOYS

The Brooklyn Vocational School for Boys, which was opened in the summer of 1915 under the supervision of the principal of the Murray Hill Vocational School, has a similar organization. The school is located on the seventh floor of the Cary Building, which has approximately a floor area of 13,000 square feet. The layout of this space is planned to utilize to the greatest advantage every particle of light and every square foot of floor area.

Classification of Pupils for the Trade: As in the Murray Hill School, each boy is permitted to enter the trade of his choice and given a try out period in that trade. If his work is not exceptionally good he is shifted from trade to trade until he finds himself, or proves that he does not care to follow any of the trades offered by the school. The distribution of the boys for the different trades taught was as follows in March, 1917:

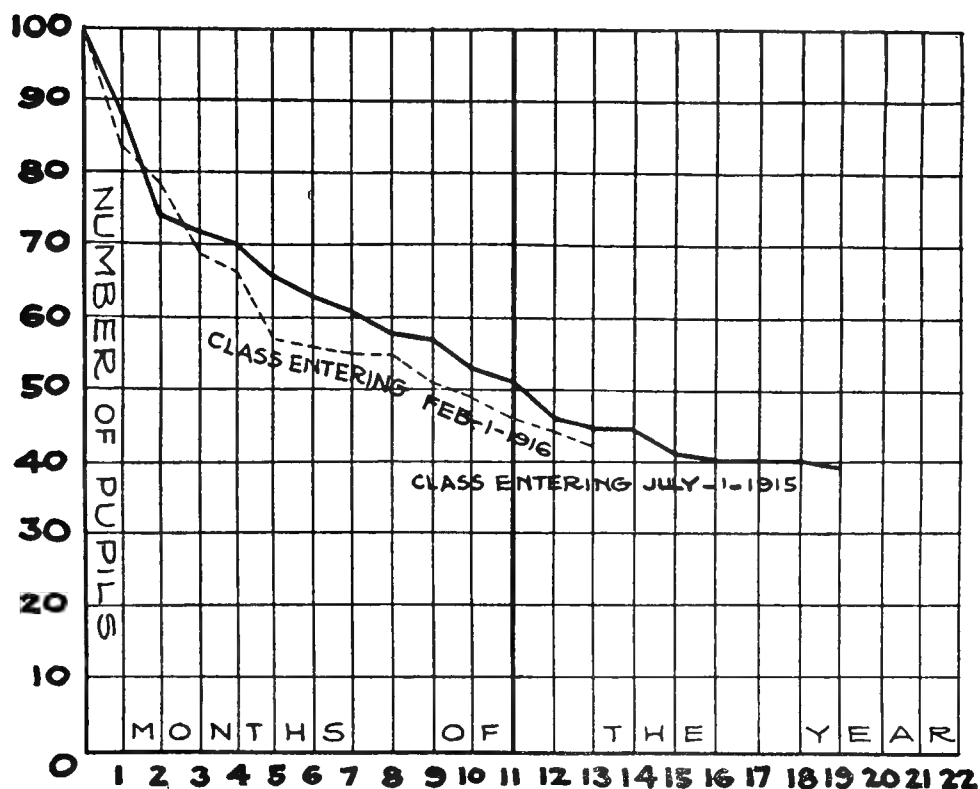
- | | |
|-------------------------------------|-----------------------------------|
| 1. Wood work—32 | 4. Drafting—55 |
| 1. Joinery | 1. Mechanical—55 |
| 2. Cabinet making and finishing | 2. Architectural |
| 3. House carpentry | 3. Making and reading blue prints |
| 2. Metal work—79 | 5. Garment design—24 |
| 1. Machine shop practice | 1. Cutting |
| 2. Tool and die making | 2. Designing |
| 3. Sheet metal work | 6. Printing—46 |
| 3. Electric work—87 | 1. Composition |
| 1. Electric wiring and installation | 2. Imposition |
| 2. Instrument making | 3. Proof reading |
| 3. Electric signs | 4. Press work |
| 4. Electro-plating | |

Holding Power of the School: Since the school was not opened until June, 1915, its holding power for the full two-year course has not yet been demonstrated. The 1915-16 report of this school gives the average daily register for the school year as 237, the average daily attendance as 217 and from these two numbers the percentage of attendance is figured as 91.5. Since an average of ten percent of the enrollment leave each month to be replaced by new boys who are admitted, the 91.5 percent of attendance does not present a true picture of the real attendance.

The record of the first hundred pupils who entered the school exclusive of those transferred from the Murray Hill School, is shown in Chart No. 9. For a basis of comparison with the July class in this school, as well as with the February and July classes in the other vocational schools, a study was made of the first hundred pupils who entered the school in February, 1916.

The two groups show practically the same loss from month to month. At the end of the third month 28 per cent. of the July class had quit and 31 per cent. of the February class. At the end of the first year there remained in the school 51 per cent. of the July class and 46 per cent. of the February class. It seems

CHART 9
BROOKLYN VOCATIONAL SCHOOL FOR BOYS



This chart shows the enrollment month by month of two groups of one hundred pupils each who entered this school in February and July, 1916. It reads as follows: Of the class entering in July 89 remained more than one month, 75 remained more than two months, etc.

reasonable to assume, therefore, that something like 50 per cent. of the pupils who enter this school will remain to the end of the first year and between 25 and 35 per cent. will finish the two-year course. The admissions and discharges month by month since this school opened are shown below:

	1915		1916		1917	
	Admis- sions	Dis- charges	Admis- sions	Dis- charges	Admis- sions	Dis- charges
January	...	..	6	11	99	48
February	...	..	111	19	15	20
March	...	..	11	12	7	20
April	...	..	7	16	...	..
May	...	..	3	10	...	..
June	150	..	6	16	...	..
July	95	1	86	36	...	..
September	71	26	48	25	...	..
October	15	18	16	46	...	..
November	2	9	11	13	...	..
December	9	4	4	5	...	..
TOTAL	342	58	309	209	121	88

It was not until January, 1917, that any of the "discharges" were due to the fact that the boys had finished the two-year course. Twenty-three of those who left in January were graduates and three more graduated in March. The boys who graduated before the school had been open two years were boys who had had part of the course at either the Murray Hill or the Boys' Vocational School.

Attendance of Pupils: The pupils show an excellent record for attendance as long as they remain in school, which speaks well for the spirit of this school. One-half of the pupils were almost perfect in attendance. An additional fourth of the group were present 17 or more days each month and less than 4 per cent. of the whole group were absent one-third of the time.

Size of Classes: The limited quarters arranged for this school and the great demand on the part of pupils for a chance to enter has enabled the school authorities to secure a more even distribution of pupils, as far as the trade classes are concerned, than is found in the other schools. When certain of the more popular trades as electric wiring, mechanical drawing and machine shop



PRINTING DEPARTMENT—BROOKLYN VOCATIONAL SCHOOL

practice registered pupils up to their maximum capacity, some boys have been willing to enter other trades rather than not be permitted to enter the school at all.

On the other hand the small total enrollment has brought up many difficulties in regard to the organization of the academic classes. The sections in mathematics, English, history and science range in size from 11 to 61 pupils. In order to get all of the trade sections into the academic classes various combinations of trade groups have been made which have tended to nullify any correlation which might otherwise have been made between the trade work and the academic work. It has also been impossible to put pupils of the different terms in different sections.

Examples taken from the organization of the classes in trade mathematics which recite three times a week will illustrate the problem of arranging the classes in a trade school that has a small enrollment. Nine of the eleven groups have forty or more pupils in the class, one group 61. The pupils taking garment design are in two groups, one group having in it pupils of the first and second terms, the other group having the pupils of the third and fourth terms. On Tuesday, one of these groups recites mathematics with a group of printers also made up of pupils from two different terms. On Wednesday they have their mathematics with the drawing pupils of all four terms. On Friday they have the teacher and period to themselves. Woodworkers, printers and garment designers, six different term groups, go to make up one section in mathematics and there is no section where the pupils of one term of one trade recite mathematics by themselves. The trade classes in garment design, woodwork and sheet metal range from 12 to 18 pupils. The printing and machine shop classes enrolled from 24 to 25 pupils. In electric wiring and mechanical drawing where vacancies in the corps of teachers had not been filled at the time the survey was made, the classes had from 40 to 50 pupils.

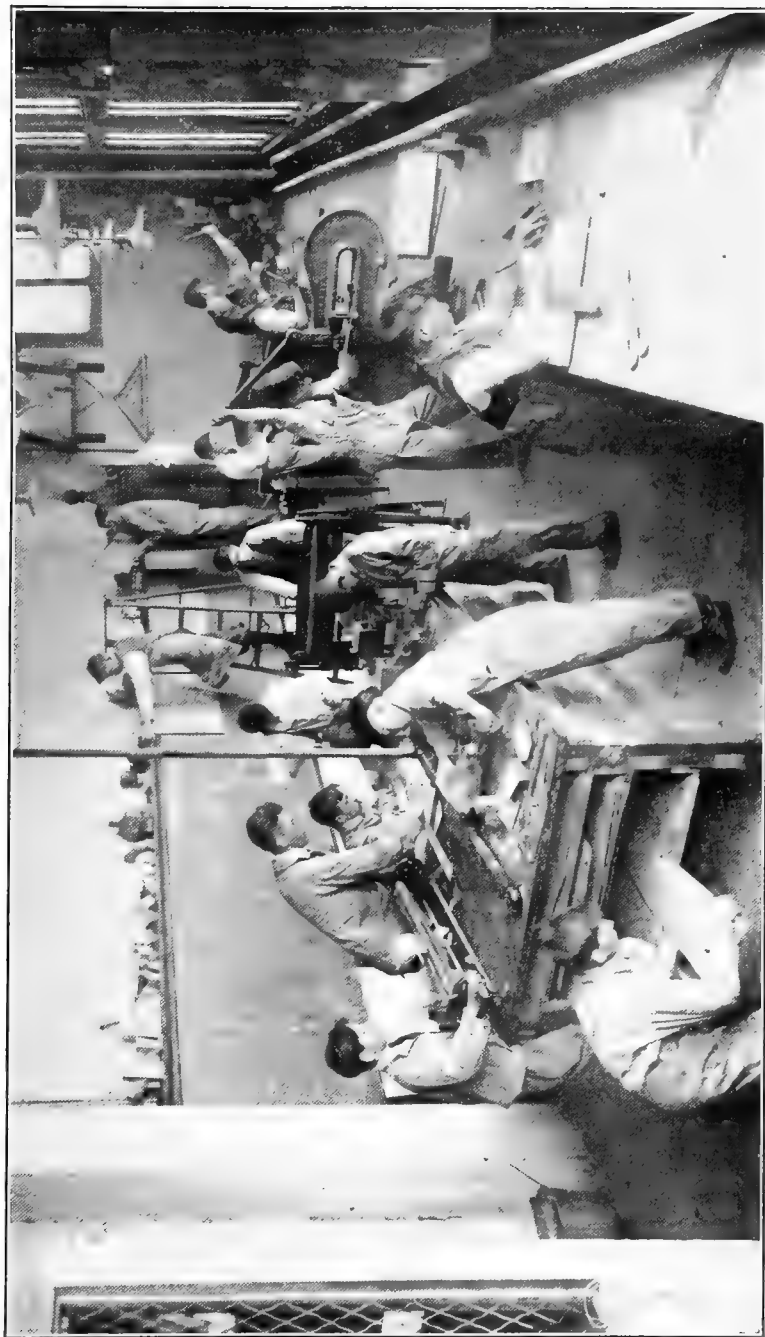
Courses of Study: What was stated under this head in describing the Murray Hill School also applies to the Brooklyn Vocational School, the two being under the supervision of the same principal. The title page of the eight courses of study which the survey staff were able to receive (history, garment design, electric wiring, machine shop work, English, trade mathematics, trade drawing, mechanical drawing), stated that they were made for both schools.

The Relation Between Academic and Trade Instruction: The general scheme of work for the Brooklyn Vocational School is the same as for the Murray Hill School. This gives a total of 20 hours a week to the academic work and 15 hours a week to the trade work. As was pointed out in describing the size of the sections in the academic work, the teachers of these subjects are greatly handicapped not only by the excessive size of the classroom unit but also by the mixture of boys of different trades and different terms of different trades in the same class.

It was not uncommon for a teacher to hear a part of a class recite and then assign to them a study lesson, next hear a second group recite and assign to them a study lesson and then devote the remainder of the class period to a third group. In some recitations the instruction was directed to the middle term groups. This gave the boys of the fourth term work that they had already had and left the boys of the first term perplexed at what they could not understand. Another plan was to present matter that was only new to all of the different divisions in the class but was so general in its nature that it was equally adapted to each division.

In all the classes the spirit shown between the teacher and the pupils was excellent. The boys showed by their attitude that they liked and respected their teachers. There was good attention in class at all times without anything approaching the military type of discipline.

Shop Instruction: The character of the instruction in this school is practically the same as the instruction in the Murray Hill Vocational School. The work consists largely of graded exercises similar to those found in many high school manual training departments. Very little attempt is made to introduce practical constructive problems. The work is also seriously handicapped by lack of equipment and room. For example, in the machine shop there are 24 boys in one section and 25 in the other. The equipment provided will permit only 14 boys to work on machines at one time and as a result part of the class has to work at the bench or two boys have to be assigned to one machine. In the print shop the sections are made up of 25 and 24 boys respectively. The equipment and quarters are not large enough to accommodate this number and the difficulties of instruction are greatly increased by the overcrowding. The work in the electrical



CLASS IN SHEET METAL WORK—BROOKLYN VOCATIONAL SCHOOL.

department was also greatly handicapped at the time of the survey by large classes and by lack of teachers. At that time one instructor was employed who had charge of two shops, with two sections each day of forty-six boys.

The work of the drawing department at the time of the survey was general in its character due to the fact that one instructor was teaching sections of 50, 46, 42 and 16 boys.

The Teaching Staff: The teaching staff was composed of eleven teachers for full time and one teacher of physical training for half time. The teachers of history, English, science, mathematics and mechanical drawing were regular teachers and the other teachers of the trade subjects were substitutes. As in the Murray Hill School, the teachers of science, history and English are exceptionally well educated men. They were graded as excellent teachers in the elementary school and were selected to teach in this vocational school when it first opened because of their proven ability. No one of the three has had trade or technical training or experience.

All three of these teachers were receiving the maximum salary in the elementary school and with the \$200 additional salary paid elementary school teachers on being transferred to a vocational school, they are now receiving \$2,600 a year. The length of the school day for these teachers who were transferred from the elementary school is the same as it was there—five hours a day.

Trade Teachers: Of the trade teachers all were substitutes at the time of making the survey except one of the teachers in mechanical drawing. One of the trade teachers is a high school graduate, another completed two years of high school work and most of the others have taken evening courses in Cooper Union, the Polytechnic Institute or evening trade schools. All have had considerable trade experience, the average for the group being 16 years. The salary each was earning just before entering the school as a teacher was in most cases the union scale for that trade, \$27.50, \$30.00 or \$35.00 a week. As they were all substitutes each received the regular pay for substitute teachers, \$5.00 a day for each day the school was in session. Each of the trade teachers teaches seven hours a day.

Building: At the time of the survey there were seven shops and five class rooms located on the floor of the loft building where the school is located. The shops are very small and the work of

the school is seriously limited by lack of room. The shops are well laid out and every available square foot of floor space is used to the best advantage. The lighting in most of the shops is very satisfactory and the ventilation good. The elevator service in the building is very unsatisfactory because of the great delays in getting the pupils in and out of the school.

The principal of this school points out in his annual report that the present arrangement is but a makeshift and recommends that a special building be designed and erected for vocational work in the Borough of Brooklyn.

Records and Reports: In practically all respects these were identical with those of the Murray Hill School.

Analysis of Costs: As this school was not organized until June 21, 1915, the annual per capita cost of \$111.21 given in the financial report of the Board of Education is for only the remainder of the school year. The cost per capita-per-hour for the six months of that year that the school was in session was 16.27 cents. The fact that this was twice the per capita-per-hour cost in the other vocational schools was due in large measure to the fact that the cost for supplies was almost as much as the cost for instruction. Since much of this was spent for material that will be used several years such as textbooks, charts, etc., the per capita cost for 1916 was probably much less. The exact figures were not available at the time of writing this report.

The relation between the cost for overhead expense and the salaries for academic and trade instruction is shown in the table below. Since the school was being organized during the year 1915 the costs for the two years are not comparable.

PER CAPITA-PER HOUR CASH DISTRIBUTION FOR
SALARIES ONLY

Year	Other than Teachers	Teachers of Non-Vocational Subjects	Teachers of Vocational Subjects	Total per Capita-per- Hours for Salaries
1915	.0242	.0023	.0656	.0921
1916	.0043	.0256	.0309	.0608

The smallest register for any trade course for the month of March, 1917, was 24 pupils. The Boys' Vocational School had five trade courses that month that had ten or less pupils registered and the Murray Hill Vocational School had one with less



CLASS IN GARMENT DESIGN—BROOKLYN VOCATIONAL SCHOOL

than ten registered. As pointed out before, it is the small trade class that causes the cost to become excessive.

The difference in the salary of the academic teachers and trade teachers is very noticeable. Three teachers of academic subjects received a total of \$780 a month for a total of 300 hours of teaching. Eight trade teachers receive a total of \$800 a month for a total of 1,120 hours of instruction. The per capita-per-hour cost for the academic instruction is kept down in spite of the high salary and short school day of the teachers of these subjects, by registering excessively large classes in these subjects. As was pointed out in the paragraph describing the size of classes, this lower cost has been secured at the expense of correlation between the shop course and the trade, efficiency of the academic work has been sacrificed in order to lower the cost.

SUMMARY:

1. The school is located on the seventh floor of a loft building and has very poor elevator service. The quarters are so small that a very limited number of boys can be accommodated.
2. The boys are more evenly distributed among the trades taught than in the other vocational schools. The smallest registration for any trade course at the time of making the survey was 24 in garment design; woodworking, the next to the smallest, had 32.
3. The school has not been organized long enough to determine with accuracy how many of its pupils will remain to the end of the two-year course.
4. The academic classes are large and mixed. Boys of different trades and different terms of the same or different trades being in the same class.
5. Trade classes of over 46 pupils both in drawing and electrical work and 24 in machine shop practice and printing were taught in small shops that were equipped for a much smaller number of pupils. Contrary to the practice in the other vocational schools there were no trade classes so small as to make the per capita cost unduly expensive.
6. As in the Murray Hill Vocational School the overcrowded academic classes prevented close correlation between the academic and the shop instruction; the shop instruction was mainly exercise work and the academic teachers received a much larger salary for teaching a five-hour day than that received by the trade teachers for a seven-hour day.
7. The records are the same in the two schools, giving a complete record of each pupil's time in school, but little history of what happens to those who fail to complete the course.

DISTRIBUTION OF PUPILS AND TEACHERS IN THE THREE VOCATIONAL SCHOOLS FOR BOYS

The accompanying table gives the number of trades taught in each of the boys' vocational schools, the number of pupils registered for each trade at three months intervals since June, 1915, and the number of teachers employed for each trade subject. The first impression one gets from examining the table is that there is little relationship between the number of boys registered for a trade course and the number of teachers employed. Neither does there seem to be any uniformity of practice between the different schools in this respect. Each of the months for which the data are given shows this very clearly. In the Boys' Vocational School six teachers are employed in the printing department for very few more boys than are handled by one teacher in each of the other schools. For woodwork in the Boys' Vocational School three teachers at salaries of \$2,250, \$2,125, and \$1,500, respectively, are employed to teach woodwork, where only about half as many boys are registered as are registered in the woodworking course in the Brooklyn Vocational School, where they are taught by one substitute teacher who receives \$5.00 a day. Sign painting has required at times three teachers and still employs two teachers for a register of nine pupils. The fact that the sign painter at the Boys' Vocational School gives lessons in lettering to printers increases the wonder as to why six printers need this assistance when in the Brooklyn Vocational School one printer is able to teach almost as many pupils without such assistance. The more the table is studied the more clearly it is seen that the attempt to teach the same trade in all schools means a great waste of money and energy.

All the pupils registered for sign painting are in the Murray Hill School.

[illegible]

T*—Teachers
P*—Pupils

MANHATTAN TRADE SCHOOL FOR GIRLS

In September, 1910, the Board of Education took over the Manhattan Trade School for Girls which had been up to that time a private, philanthropic institution. The aims and purposes of the school which have not been changed since the school was founded in 1901 were then stated to be:—

1. To train young girls who are forced to leave school and become wage earners, to enter the skilled trades.
2. To imbue them with a love and respect for work.
3. To arouse in them a desire to become the best type of workers.

Trade Departments: The different trade departments of this school cover the work of the needle trades, the electric power machine operating trades, the pasting trades and a special course in embroidery designing and perforating of embroidery patterns.

Under the needle trades comes dressmaking, children's clothing, lingerie, lamp shades and millinery. In the power machine operating classes, instruction is given not only in the sewing of women's and children's garments but also in embroidery, braiding, hemstitching, glove and straw hat making. The pasting classes do sample mounting and a variety of novelty work.

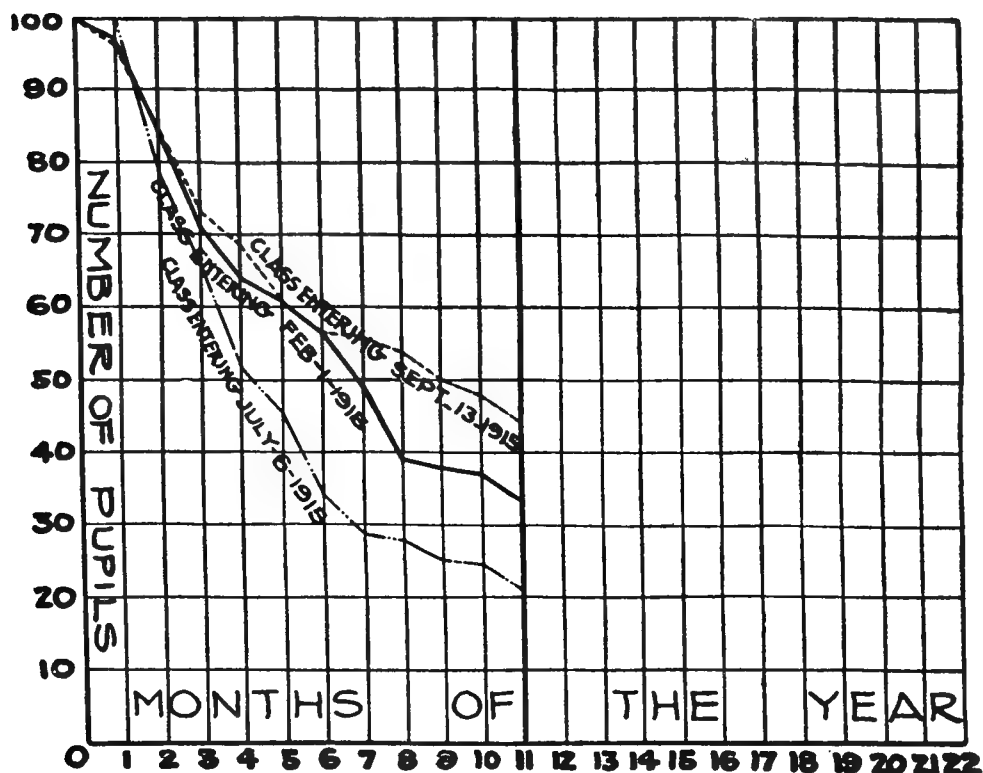
These trades were chosen because they require some degree of skill on the part of the worker in order to enter the trade and offer more or less opportunity for advancement.

Classification of Pupils for the Several Trades: The girl who enters the Manhattan Trade School must be 14 years of age (except for elementary school graduates) the others being pupils from the 7th and 8th grades who are 14 or more years old when they entered.

A girl in almost all cases is permitted to enter the trade she desires to learn and about 70 percent of all who enroll wish to become dressmakers. The number who enter each of the other trades taught is determined to a considerable extent by the equipment which the school has for teaching the trade. For instance, the number of power machines for straw hat sewing and glove making is limited, and, obviously, only as many girls can study these trades as there are machines where they can work.

Holding Power of the School: This school registers its largest entering classes in February, July and September although new

CHART 10.
MANHATTAN TRADE SCHOOL FOR GIRLS



This chart shows the enrollment month by month of three groups of one hundred pupils each that entered this school in February, July and September, 1915. It reads as follows:—Of the class entering July 6, 1915, one hundred remained more than one month, 79 remained more than two months, etc.

pupils are registered any week during the year. In order to determine the holding power of the school, the records of the first hundred pupils that entered the school during each of these three months were studied. The effect of the long summer vacation is clearly seen in comparing the attendance record of these three groups. For the first six months the holding power of the school upon those who entered in February and those who entered in September was practically the same, month by month. There were 84 of each group in the school at the end of the second month, 61 of each group at the end of the fifth month and 57 at the end of the sixth month. Then came the vacation for the class that entered in February and the reduced size of this class as compared to the class entering in September was very marked. The July entering class was very unstable as compared to those who entered in September and in February. The loss at the end of the first six months was greater than the loss from the other classes during the entire year. Some of the pupils who enter this trade school during the month of July do so with the expressed intention of spending only the vacation time in the school and most of these quit to go on with their high school work. Others who enter in July do so because there are so many girls desiring positions just at this time, due to the closing of the schools, that there are more girls than there are positions to be filled and they enter the trade school to fill in their time waiting for a chance of employment. These quit as soon as they get a job but in many cases the training which they receive in this short time enables the girls to get a start in one of the skilled trades instead of being forced to accept employment as errand girls.

Attendance of Pupils: A study of the attendance of these same groups shows that the regular habits of going to school each day were not broken when the girl changed from the elementary school to the trade school. Over a third of the girls who remained a month or more showed an almost perfect record for attendance. An additional third averaged from one to two days' absence for each month and the lower third on the average from three to six days of absence for each month they were in the school.

Sizes of Classes: The classes in the non-vocational school subjects range in size from 15 to 50. Most of the sections have between 30 and 40 pupils. In the trade classes there is an even greater proportional range. The requirements of each trade

determine the number of teachers needed. Not only do some trades require a much larger number of teachers in proportion to the number of pupils than do others, but certain operations in each trade process require that the teacher should be responsible for a smaller group than the teacher of another process of the same trade. It can readily be seen that the teacher of elementary sewing can be expected to get satisfactory work from a larger group of girls than can the teacher of advanced waist draping.

The Relation Between Academic and Trade Instruction: The Manhattan Trade School has from the first stated that its aim was "to train young girls forced to become wage earners to enter the skilled trades." They have assumed that if general education was desired by the girls that they would remain in the elementary school or enter the high school. Each of the published reports of the school has greatly simplified the academic instruction and reduced the time devoted to it.

In the Murray Hill and Brooklyn Vocational Schools twenty hours a week are given to the academic work and fifteen hours a week to trade work. In the Boys' Vocational School the time is equally divided between the academic work and the trade work. In the Trade School for Girls twenty-five hours a week are devoted to trade practice and seven and one-half hours to instruction in the academic subjects.

The time that is devoted to the non-vocational subjects is confined entirely to work related to the trade. The arithmetic is simple measurements of materials and cost of labor and materials used in the making of garments. The English is the writing of business letters such as applying for positions, making appointments and ordering goods. The course in textiles acquaints the girls with the different kinds of goods, their qualities and the methods used in testing fabrics.

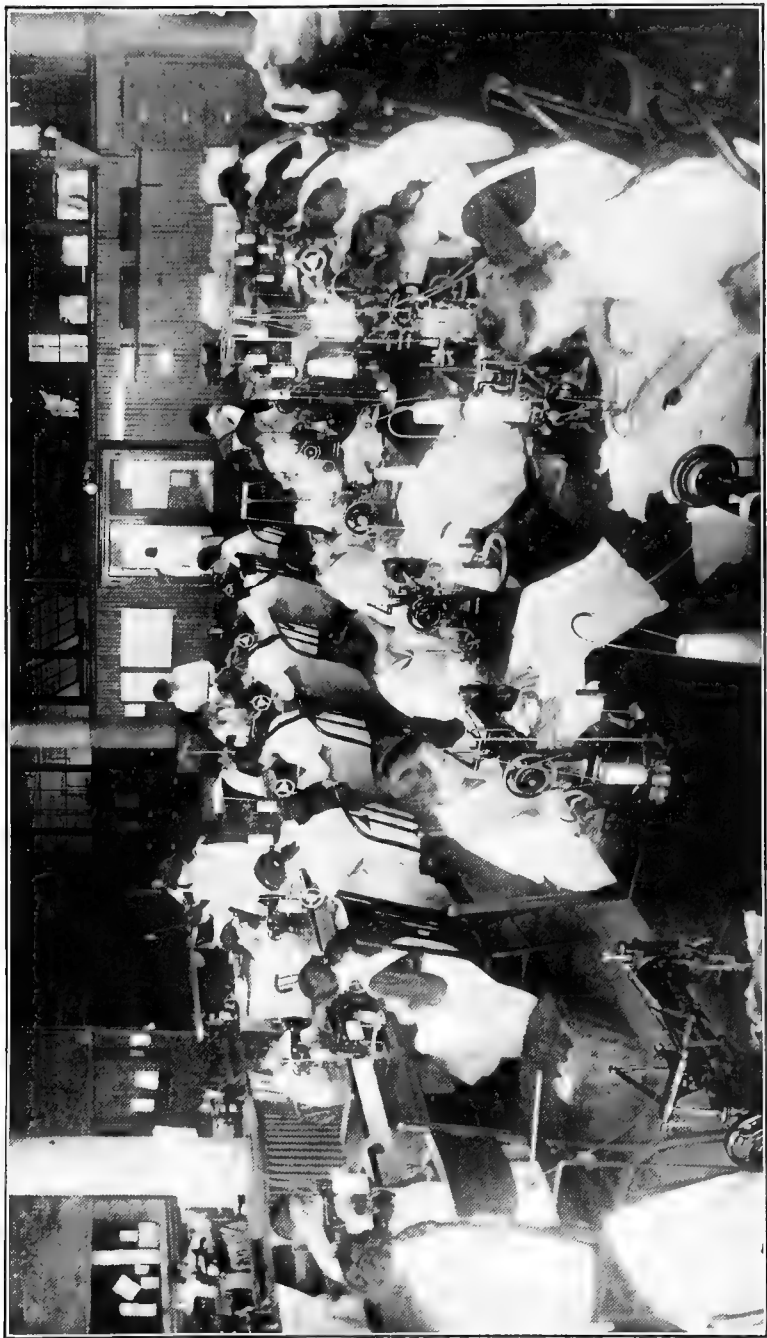
Character of the Instruction: "Instruction in the trade school is individual. Classes are so arranged that girls may enter at any time, complete the work of each grade as rapidly as their ability will permit, and pass on to the next. In each trade the work is divided into steps leading from simple beginnings to more complex processes, and girls advance from table to table, from room to room, or from machine to machine, in accordance with their own effort and ability. Each table, room or machine

has its special tasks, to which a certain time allotment is given, so that girls who cannot accomplish tasks assigned to that particular step within the required time, soon recognize that they will be more than a year in completing their course. Girls who can work ahead of scheduled time are given credit for such time as they can save, and hence complete their course in less than the required year. This method of promotion places a premium on individual effort and gives a keen zest to all of the work.

"In order to gain promotion a girl's work must, of course, reach certain required standards, otherwise she is kept back, and expected to repeat it, or she is urged to try some other trade if the results of her efforts show no fitness for the one she has chosen. The fact that a girl knows that she will not be permitted to go on with her trade if she cannot reach the requisite standards, is of great help in stimulating her to do her best.

Shop Practice: "In each trade the work is sub-divided according to its particular needs, in the attempt to plan a real apprenticeship. Girls pass from process to process, until a fairly thorough knowledge of underlying principles is acquired. The classes are in reality trade work rooms where each step is being taught by an expert in that particular line. The teacher of a group acts as forewoman or head worker, taking charge of a table, a room, or a group of machines, as the case may be. She is responsible for such portions of the work as are assigned to her by the manager of the shop. She works with her girls, shows them how to perform the different parts, and sees that each one has a chance for practice in the various processes. A girl thus passes from table to table, and from room to room, gaining, in the course of a year, a knowledge of such parts of the trade as her maturity and judgment will permit. At the end of her course she goes out as a helper in her trade, understanding its language and ready to begin at a level sufficiently high to insure her advancement to higher and higher planes.

"In the trade school girls pass gradually in their training from teachers, who know how to explain and demonstrate, to business women who merely give directions which they must follow. Because of this painstaking drill in fundamentals the average trade school girl is more likely to succeed than one who goes into trade without such knowledge. There is little time for explanation in a shop, and hence girls who have a fair amount of ability, but who have not learned what might be called the



POWER MACHINE OPERATING DEPARTMENT—MANHATTAN TRADE SCHOOL

'letters of their trade,' frequently fall by the wayside. A trade school girl, on the other hand, has learned to interpret the trade language, and when told to perform a certain piece of work is able to analyze her problem and do it."

The Teaching Staff: The two teachers of academic subjects, English, mathematics and textiles, are both graduates of the Brooklyn Training School and each has taken several college extension courses since becoming a teacher. Both were elementary school teachers of experience who were transferred to the Manhattan Trade School under the rule of the Board of Education permitting this to be done and granting an additional \$200 salary to such teachers as were transferred to vocational schools. The small number of teachers transferred under this rule from the large number who might desire to teach in a vocational school, because of the freedom of the work as well as the increase in salary, gives the chance of securing the very best of the elementary school teachers. As in the case of the Murray Hill School and the Brooklyn Vocational School, where the academic teachers were also secured by transfer from the elementary school, excellent teachers have been selected. The school day for the academic teachers is five hours in length, the same as the length of the day in the elementary school.

Trade Teachers: The following positions and salaries for trade teachers in this school are recognized in the salary schedules of the Board of Education:

Head of Trade Department.....	\$1,600	\$2,000
Department Vocational Teachers.....	1,000	1,500
Vocational Teachers	900	1,100
Placement and Investigation Teachers.....	1,100	1,400
Substitute Head Teacher	6.00	per day
Substitute Placement and Investigation Teacher.....	5.00	per day
Substitute Teacher of Sewing	4.00	per day
Substitute in Non-Vocational Subjects.....	.50	per hour
Substitute Department Vocational Teacher.....	5.00	per day
Substitute in Vocational or Trade Subjects.....	5.00	per day
Substitute Teacher Clerk	4.50	per day
Substitute Assistant Teacher	3.50	per day
Substitute Trade Order Teacher	3.50	per day
Substitute Assistant Trade Order Teacher.....	2.50	per day
Substitute Assistant Teacher Clerk	3.50	per day
Substitute Trade Helper	1.00	per day

In probably no other place in the school system is it more difficult to adjust the machinery that was devised for selecting and paying teachers of academic subjects to the needs of a school of a different type. Although all of the above classifications were made especially for this school many more should be made to secure the most efficient service. There is no provision for the employment of teachers with trade experience in specialized subdivision of the different trades which the school teaches. A fixed salary rate for all trade teachers has no relationship to the payment for similar work in trade. It tends to prevent the school from securing the services of the best trade workers in some of the better paying trades and pays some trade workers considerably more than they could secure in the trade itself.

This school is holding its substitute teachers much longer than the salary paid substitute teachers in the boys' vocational schools enables them to hold their teachers. Two-thirds of the substitute trade teachers have been in the school for five or more years.

The school has been without a teacher of glove making for several months and the machines have been idle, not because it was impossible to secure a teacher who understood all about the making of gloves, but because it has so far proven impossible to secure a glove maker who could pass the English examination given by the board of examiners.

Buildings and Equipment: The building and equipment are under lease by the Board of Education. The quarters have proven entirely too small and a building that will be adequate in every way for the needs of the school is now under construction. At the time of entering into the lease in 1910 a valuation of \$5,500 was placed upon the equipment by the trustees; since then the school, through the profits made on the sale of its manufactured product, has been able to purchase considerable new equipment each year.

Records of Pupils' Work: "A record of each girl's work is kept from the time she enters the school. This is estimated in quality of workmanship, rapidity with which she works, and her attitude toward her tasks. When placing girls in trade these records are used by the placement secretary in recommending them for positions and in seeking for them an opportunity where their particular talent will count most. Moreover, it helps the school to speak with some authority both as to the kind of service a girl can render and her probable wage value. It has, too, given

the girl an idea of measuring her own efficiency and an understanding of the basis on which her wage value may be reckoned. Each girl's trade record is kept on file and is continued as long as she is willing to report back to the school. The girls report willingly and are of great assistance in keeping the school in close touch with the daily problems and difficulties they are meeting." The employers are also asked to report on the work of the girls and state in what respect, if any, their work is unsatisfactory.

From the records which were on file a study was made of the wages received by the girls who graduate from this school in the dressmaking department and the power operating department. The table below shows the distribution of four groups of girls according to the weekly wage received at the start and at the end of the first year of service.

TABLE SHOWING THE WEEKLY WAGE RECEIVED BY GRADUATES OF THE MANHATTAN TRADE SCHOOL FOR GIRLS AT THE START AND AT THE END OF THE FIRST YEAR OF APPRENTICESHIP IN POWER OPERATING AND DRESSMAKING

Weekly Wage	POWER OPERATING		DRESSMAKING	
	Beginners	After one year	Beginners	After one year
\$ 5.00.....	12	..	8	..
\$ 6.00.....	16	4	32	3
\$ 7.00.....	17	9	..	20
\$ 8.00.....	5	14	..	..
\$ 9.00.....	..	5	..	8
\$11.00.....	..	2	..	..
\$11.00.....	..	2	..	4
\$12.00.....	..	4	..	..
\$14.00.....	50	50	40	50

This school has had a placement department for many years. This department not only places the graduates of the school when they first finish the course but also keeps in touch with the girls and their employers. The following table shows the number of calls that employers made upon this department:

EMPLOYERS' CALLS FOR YEAR 1916-1917

Dressmaking and Miscellaneous Sewing.....	817
Millinery	87
Lamp Shades.....	69
Garment, Embroidery and Straw Operating.....	289
Samples and Novelty	134

1390

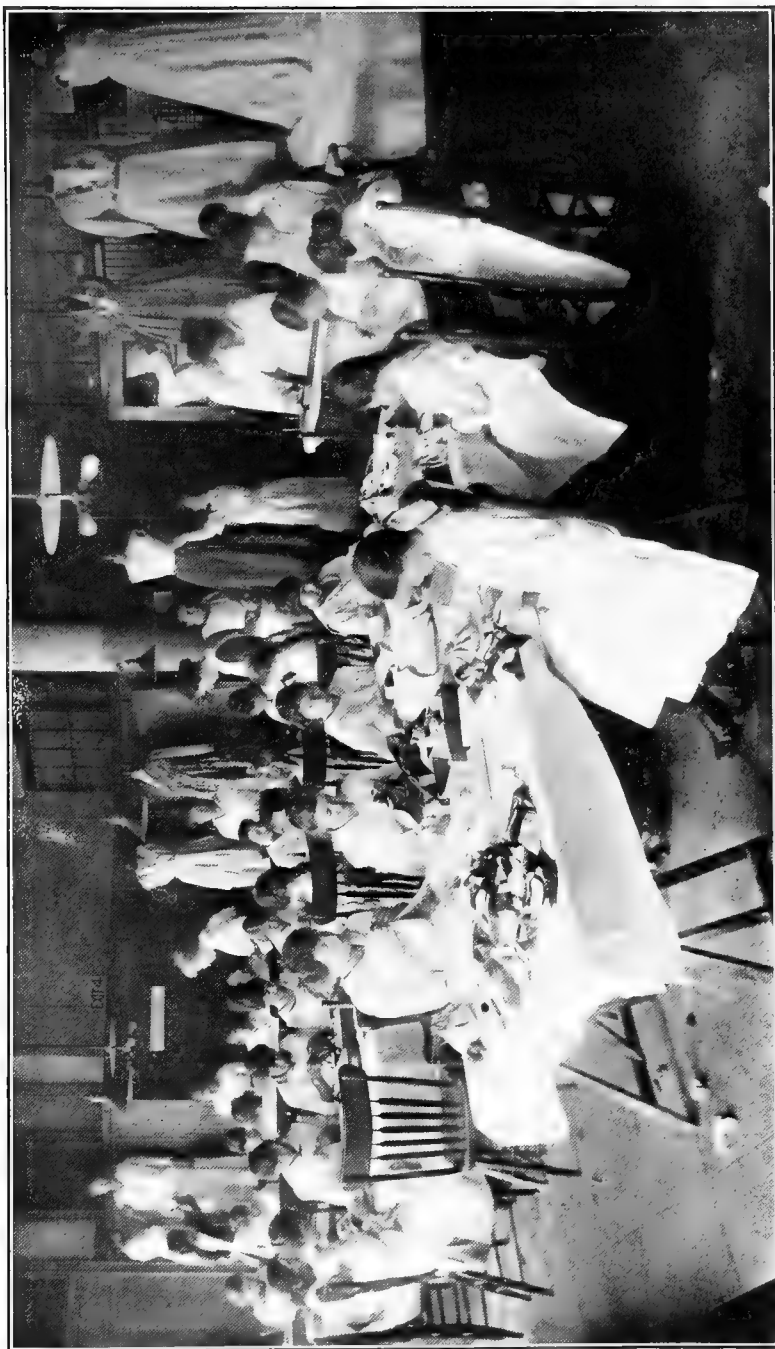
In filling these positions both the recent graduates of the school and those who had previously finished the course and applied to the placement teacher for help in securing a better position were used. The table following shows the weekly salaries secured by the 237 girls who were going into employment for the first time. Nineteen percent of these were under 16 years of age.

	\$0.00	\$6.00	\$6.50	\$7.00	\$8.00	\$8.50	\$9.00	\$10.00	Pc.	Total
Dressmaking	3	78	21	44	3	..	..	..	..	149
Millinery ..	1	4	..	7	1	..	..	..	..	13
Lamp shades	..	..	..	4	2	..	..	..	..	6
Samples ...	1	8	2	5	..	..	..	..	..	16
Novelty	..	2	..	3	2	..	..	..	2	9
Garment Op.	..	..	..	10	..	..	..	..	2	12
Embroidery										
Op.	..	..	..	5	7	1	1	1	..	15
Straw Op..	..	..	..	1	3	..	..	..	12	16
Glove Op...	..	1	..	..	..	..	..	..	..	1
	5	93	23	79	18	1	1	1	16	237

During the year 1916-1917, 619 applications were received from girls who had formerly been placed by this department. In this number there were 435 dressmakers, 33 milliners, 88 power operators, 44 sample and novelty workers and 19 who desired lamp shade work. Of this number 444 were placed as shown in the table below:

	\$5.00	\$6.00	\$6.50	\$7.00	\$7.50	\$8.00	\$8.50	\$9.00	\$10.00	\$11.00	\$12.00	\$13.00	\$14.00	\$15.00	\$16.00	\$17.00	\$18.00	Day	Piece Work
Dressmaking ...	3	30	6	97	2	72	2	22	36	5	34	2	3	1	2	1	3	14	2
Millinery		1		6	1	1		2	2									3	
Lampshades		2		5		3		1	2										2
Samples		1	1	8		1		1	1										
Novelty	1			4		2		1										1	4
Garment Op....				5		6		1											7
Emb. Op.....				3		5		3	1	1	3		1						2
Straw Op.....									1										10
Total.....	4	34	7	128	3	90	2	31	42	6	37	2	4	1	2	1	3	18	29

Commercial Product: Four-fifths of the trade school program is devoted to trade practice. This means that it is necessary for the school to provide a large amount of material and it results in the school having a considerable manufactured product each year.



CLASS IN ADVANCED DRESSMAKING—MANHATTAN TRADE SCHOOL

marketable product in order that the girls may have the same standard set before them in the school that they will meet in the commercial world outside and also that the girls may be furnished with material that in both quantity and quality will furnish the highest type of training. From January, 1916, to December 31, 1916, the school used material in their shops costing \$11,848.29. This material when sold as a manufactured product produced \$19,112.63, giving the school a profit of \$7,264.34. The amount gained from these sales is used to purchase supplies and equipment for the school.

SUMMARY:

1. Seventy per cent. of the girls who enter this school take up dressmaking. Lack of equipment keeps the classes in power operating smaller than they would be if all of the girls who desire to learn this trade could be accommodated.
2. Many girls who enter the school do so to get a start in some factory, and leave as soon as there is an opening. About a third of those who register in the school remain to the end of the course.
3. The academic work is mainly that which is developed in the trade taught and so is very closely correlated with the trade instruction.
4. The trade instruction is definite and well graded so that the completion of one operation or process leads directly to one slightly more complicated and difficult.
5. The standard of the commercial shop is the standard of the school shop both for quality of work and speed on the part of the worker.
6. Most of the teachers of the school are serving as substitutes on a per diem salary schedule. There is little change in the teaching force compared with the change of substitute teachers in the vocational school for boys. Two-thirds of the substitute teachers have been connected with the Manhattan Trade School for five or more years.
7. The present building is totally inadequate and a large building is now being erected for this school.
8. The records of the pupils, both while in school and after they have left, graduates and non-graduates, are extensive and well kept.

REPORT OF THE ADVISORY COMMITTEE ON DAY VOCATIONAL SCHOOLS

After studying the findings of the survey of the day vocational schools and the surveys of the trades of printing, machine work, carpentry, and inside electrical work, and visiting the three trade schools for boys, your committee submits the following report:

The committee believe that conditions in the above-mentioned trades, as revealed by the various surveys, make it advisable for the City of New York to maintain day vocational schools giving instruction that shall prepare young persons to enter these trades at 16 or 17 years of age.

In this connection, and for the sake of clearness, the committee would record their definition of such schools:

By vocational schools the advisory committee has in mind schools giving full-time day industrial training in the period between elementary general education and pre-vocational training on the one hand, and the period of employment on the other. The function of the day vocational schools is regarded as that of giving pre-employment training.

In the printing and machine trades, the committee believes that there is not only a lack of ideas as to materials and methods, that in part at least can be taught effectively to boys in a pre-employment school, but that each of these trades is capable of absorbing each year a considerable number of boys of 16 or 17 years of age whose chances of advancement to high-grade positions would be materially assisted by training in such schools.

On the side of the trade, such schools should furnish a supply of well prepared boys who have passed through an extended selective training and whose chances of success in the trade would be greater than those who have not had such preparatory training.

If maintained in close co-operation with the industries, such schools should serve a helpful office in adjusting the supply of young workers to the needs of the trades.

With the conditions existing in the carpentry trade, it is evident that there is not the opportunity for young workers of 16 or 17 years of age to enter the trade with the chance for advancement to high-grade work that is present in the case of printing and machine work. Such openings are limited to the mills and shops dealing with high-grade work and to the comparatively few opportunities presented for after advancement to foremen and other supervisory positions in both inside and outside work. These opportunities, however, seem sufficient to warrant the maintenance of pre-employment classes of limited size in this trade.

In the trade of inside electrical work, the committee realize that the following conditions are present: first, it is difficult to duplicate practical trade conditions in a vocational school; sec-

ond, there is a well organized apprenticeship plan in the trade and many young workers are taking evening courses of instruction that necessarily follow lines similar to those that must be dealt with in the day schools. They believe, however, that such classes are warranted if their scope is widened to include other branches of electrical work.

In regard to the school organization best fitted for such training, they believe that in the case of printing, the instruction should be given in a central school, for the reasons that more complete equipment and a more comprehensive teaching organization can be secured, greater co-operation with the industry is possible and better control could be had over the numbers entering training in relation to the needs of the trade.

The extensive and differentiated equipment of such a school would also be of great value in serving other phases of instruction, such as evening classes for journeymen and apprentices and part-time classes for the younger apprentices.

The same considerations obtain in regard to a central school for the machine trades.

The committee feel that instruction in carpentry and electrical work could most effectively be maintained in a central school for the building trades along with other courses in this field. While one such school would, at first, be all that is necessary, other schools could be added as the need became apparent until each borough is provided.

In order to furnish effective vocational training, it is essential that the training shall be given to a group of individuals who have already determined that they wish to be trained for that particular trade or occupation.

A specialized central school backed by the interests of the trade dealing in part-time and trade extension classes and standing before the community as the headquarters of the trade, will present a situation much more likely to attract a group of pre-employment pupils who have already formed their desire to be trained for that particular trade than schools in which this course appears only as an element among other courses.

The contact of pre-employment pupils in such a central school with the higher processes of the trade and with the workers in the trade will exercise a strong influence in retaining their attendance for the full course of pre-employment instruction.

The committee recommends that pupils admitted to these schools shall be at least 14 years of age and have completed at

least the sixth grade of school. They should be required to pass a physical examination based on the particular needs of the trade in question. At the end of the first term all pupils should be rated carefully as to their hand skill and industrial intelligence, and those who fail to give satisfactory promise of success as trade workers should be dropped from the school. The numbers admitted should not exceed the point where the number of graduates will be greater than experience indicates can be absorbed by the trade. When the demand for admission to these schools exceeds the numbers so determined, competitive examinations aimed to test manipulative skill and general intelligence should be used as a basis of selection.

Courses provided in the day schools should include shop training, directly related technical instruction, instruction desirable for citizenship and elements of general education. Material for courses of instruction in shop work and in related subjects are indicated in the analysis of the trades as given in the different surveys.

The committee recommend the organization of courses of instruction on a basis that will require two years for completion as at present. They favor at the same time providing shorter unit courses in machine shop work that will allow pupils who cannot remain for two years to enter the trade as machine hands or operators.

In the matter of the length of school day, the committee feel that this should approach the length of the usual industrial day as nearly as the physical development of the pupil will admit, considerations being had of the time required for traveling back and forth between home and school. They make no recommendation to change the present time of seven hours. The committee believe that there should be provision for this type of training for practically the entire calendar year.

The committee recommended that the number of pupils assigned to one teacher of shop work shall not exceed 16. In regard to the character of the shop work, the committee recommend that in the schools devoted to the printing trades, machine trades, and building trades, there shall be a certain amount of productive work, not for the sake of production, but because in their judgment, experience in productive work is the only fully efficient method of trade instruction. They believe that in many instances such productive work can with advantage be supplemented by technical exercises of the laboratory type.

In the case of the electrical trade, the work would, of necessity, be practically all of the latter type.

The committee recommend that before any further classes in day vocational schools are opened, that equipment should be provided that is sufficient in extent to meet all the needs of the numbers under instruction and of a character and quality that conform to the requirements of modern trade practice.

The committee further submit the following plan to carry the above recommendations into effect: The establishment of a central school for the printing trades; the establishment of a central school for the machine trades; reorganization of the vocational school at 138th Street, Manhattan, as a school for the building trades; discontinuation of the Murray Hill Vocational School; reorganization of the Brooklyn Vocational School as a school for the building trades.

Signed,

CHARLES R. ALLEN,
FRANCIS H. WING,
E. E. MACNARY,
L. H. CARRIS.

EVENING TRADE SCHOOLS

The Brooklyn Evening Technical and Trade School and the Long Island City Evening High and Trade School were opened during the school year of 1905-1906 and three years later a third, the Stuyvesant Evening Trade School, was added. The large increase in the number of evening trade schools came during the years between 1911 and 1914. In 1911-12 the Harlem Evening Trade School was opened; in 1912-1913 the Murray Hill, the Tottenville and the Manhattan Evening Trade School for Girls were opened and in 1913-1914 the New York Evening School of Industrial Arts and the Bushwick Evening School were added. The number during the school year 1916-1917 is the same as in 1913-1914. These nine schools give instruction in the men's trades with the exception of the Manhattan Evening Trade School which is for women and the New York Evening Trade School of Industrial Arts which is for both men and women.

The names of the schools with their distribution by boroughs is given below:

TABLE SHOWING NUMBER AND DISTRIBUTION OF EVENING TRADE SCHOOLS BY BOROUGHS

Borough of Manhattan

Evening School of Industrial Arts
 Harlem Evening Trade School
 Manhattan Evening Trade School
 Murray Hill Evening Trade School
 Stuyvesant Evening Trade School

Borough of Brooklyn

Brooklyn Evening Technical and Trade School
 Bushwick Evening Trade School

Borough of Queens

Long Island City Evening High and Trade School

Borough of Richmond

Tottenville Evening Trade School

Trade extension courses are also offered in the following evening elementary and high schools:

Borough of Manhattan

East Side Evening High School
 Harlem Evening High School for Women

Borough of Manhattan

New York Evening High School for Women

Public School No. 22

Public School No. 67

Public School No. 95

Washington Heights Evening High School

Borough of Brooklyn

Central Evening High School for Women

Bay Ridge Evening High School for Women

Public School No. 5

Public School No. 126

Williamsburg Evening High School for Women

Borough of Bronx

Bronx Evening High School for Women

Borough of Richmond

Public School No. 14

Public School No. 20

COURSES AND CLASSES

Courses offered and number of classes in each school at the beginning of the survey in December, 1916:

TRADE SCHOOLS

Borough of Manhattan

Evening School of Industrial Arts

Book Illustration	2
Costume Design	3
Cast Drawing	1
Decorative Design	1
Jewelry Design	1
Life Drawing	1
Mural Decoration	1
Poster Design	1
Plastic Design	1
Stained Glass Design	1
Textile Design	1
Wash and Catalogue Work	1
Total	15

Harlem Evening Trade School

Auto Mechanics	2
Blacksmithing and Forging	2
Carpentry and Joinery	1
Commercial Design	1
Electric Wiring	8
Plan Reading	2

Borough of Manhattan

Harlem Evening Trade School—Continued

Plumbing	2
Printing	4
Monotype Operating	2
Linotype Operating	2
Mechanical Drawing	2
Machine Shop Work	2
Sheet Metal Drafting	1
Structural Steel Drafting	1
Total	32

Murray Hill Evening Trade School

Architectural Drawing	1
Baking	2
Carpentry and Joinery	2
Commercial Photography	2
Electrical Installation	4
Electrical Engineering	2
Electric Theory—Municipal	1
Gas Engine Mechanics	4
Kelly Press Operating	2
Ladies Garment Design	4
Litho-Photography	2
Machine Shop Theory	3
Mechanical Drawing	1
Motion Picture Mechanics	2
Off-set Printing	2
Printing	2
Player Piano Mechanics	1
Plan Reading	1
Plumbing	4
Structural Steel Design	1
Sheet Metal Drafting	1
Surveying	1
Sign Painting	2
Total	47

Manhattan Trade School for Girls

Drafting	2
Draping	2
Garment Operating	6
Novelty Work	1
Special Machine Operating	2
Straw Machine Operating	2
Total	15

Borough of Manhattan

Stuyvesant Evening Trade School

Architectural Drawing	1
Cabinet Making	2
Carpentry and Joinery	1
Chemistry	4
Electricity—Applied	2
Electric Wiring—Advanced	2
Electric Wiring	4
Freehand Drawing	1
Forging	1
Garment Design	4
Industrial Design	1
Machine Shop Practice ..	4
Machine Shop Theory	1
Mechanical Drawing	4
Photography	1
Pattern Making	1
Proof Reading	2
Plan Reading	1
Physics	2
Plumbing	4
Structural Engineering	1
Shop Arithmetic	2
Steam Engineering	1
Total	47

Borough of Brooklyn

Brooklyn Evening Trade and Technical School

Automobile Repairing	2
Automobile Equipment	1
Architectural Drawing	1
Blacksmithing	1
Carpentry and Joinery	1
Electrical Installation	5
Mechanical Drawing	5
Machine Shop Work	5
Plumbing	2
Proof Reading	1
Pattern Making	1
Plan Reading	2
Printing	2
Linotype Operating	2
Steam Engineering	1
Trade Dressmaking	2
Trade Millinery	1
Total	35



CLASS IN DRAPING—MANHATTAN EVENING TRADE SCHOOL

Borough of Brooklyn

Bushwick Evening Trade School

Auto Mechanics	1
Applied Physics	1
Carpentry	1
Cabinet Making	1
Chemistry	1
Electrical Installation and Practice.....	1
Electricity—Applied	1
Freehand Drawing	1
Gas Engine Mechanics	1
Iron Work Forging	1
Mechanical Drawing	7
Machine Shop Practice	4
Plan Reading and Estimating	1
Pattern Making	1
Plumbing	2
Ship Drafting	1
Trade Mathematics	1
Sheet Metal Work	1
Total	28

Borough of Queens

Long Island City Evening High and Trade School

Applied Electricity	1
Architectural Drawing	1
Cabinet Making	1
Gas Engine Mechanics	2
Machine Shop Practice	2
Mechanical Drawing	1
Total	8

Borough of Richmond

Tottenville Evening Trade School

Automobile Repairing	1
Gas Engine Mechanics	1
Mechanical Drawing	1
Tool Making	1
Terra Cotta and Architectural Drafting.....	1
Terra Cotta Modeling	1
Trade Carpentry	1
Trade Dressmaking.....	1
Total	8

TRADE CLASSES
EVENING ELEMENTARY AND HIGH SCHOOLS

Borough of Manhattan

East Side High School for Women

Weaving	2
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Harlem Evening High School for Women

Costume Design	2
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Trade Dressmaking	2
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Trade Millinery	2
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Total	6
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New York Evening High School for Women

Book Binding	1
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Costume Design	3
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Trade Dressmaking	2
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Trade Millinery	1
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Trade Embroidery	1
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Total	8
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Public School No. 67

Auto Mechanics	1
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Care and Use of Boilers	1
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Electrical Installation	1
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Garment Designing	2
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Total	5
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Public School No. 95

Architectural Drawing	1
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Electrical Installation	1
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Machine Drawing	1
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Machine Shop Practice	1
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Modeling	1
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Printing	1
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Sheet Metal Work	1
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Wood Working	1
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Total	8
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Washington Heights Evening High School

Trade Dressmaking	1
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Trade Millinery	1
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Total	2
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Borough of Brooklyn

Central Evening High School for Women

Costume Design	2
Trade Dressmaking	4
Trade Millinery	2
Total	8

Williamsburg Evening High School

Costume Design	2
Dressmaking	4
Total	6

Bay Ridge Evening High School

Dressmaking	2
Millinery	2
Total	4

Public School No. 5

Electrical Installation	1
Power Machine Operating	1
Sheet Metal Work	1
Trade Drawing	1
Total	4

Public School No. 126

Plumbing	2
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Borough of the Bronx

Bronx Evening High School

Costume Design	2
Dressmaking	2
Trade Millinery	1
Total	5

Borough of Richmond

Public School No. 14

Plumbing	1
Plan Reading	1
Total	2

Public School No. 20

Plan Reading	1
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Director for Evening Schools: A district superintendent is assigned by the city superintendent to be in direct charge of the evening schools. The evening trade schools are only a small part of the total evening school work as the number of classes in these schools is about 8 per cent. of the total number of classes in the evening schools. The present district superintendent assigned to the evening schools has been in charge of the work since 1914. Up to the present time there has been no position created by the Board of Education as director of trade instruction in the evening schools.

Requirements for Admission: Under a rule of the Board of Education the attendance in the evening trade classes is limited to men and women engaged in trade work during the day. Most of the pupils in the classes are over sixteen years of age, although applicants between fourteen and sixteen years of age, having proper legal work certificates, who state that they are working at a trade, are admitted.

The requirement that instruction in evening trade classes be limited to workers at some branch of the trade became effective in the fall of 1916. The rule, however, did not apply to those who were already registered in trade classes and these were permitted to continue in the class as long as they desired. This report shows under the heading "Occupations of the Men," the extent to which this requirement is operative.

The reason why so many different occupations are represented in so many of the trade classes seems due to the fact that the several principals of the evening trade schools do not have the same interpretation of what constitutes a "branch" in some of the trades. A clerk in an electric supply house would in some schools be admitted to classes in electric wiring. In other schools he would not be permitted to enter the class.

For admission to some classes, as proofreading, steam engineering and industrial science, an educational standard is set up in most of the schools.

Advertising: A number of different methods are used to bring the evening trade schools to the attention of the men and women for whom these schools are provided. Most of the schools use display cards and insert advertisements in the newspapers and trade journals. One school has a publicity committee that brings to the attention of the papers such news items concerning



CLASS IN STRAW HAT MACHINE OPERATING--MANHATTAN EVENING TRADE SCHOOL.

the evening trade schools as are of general interest. Most of the schools have circularized employers, unions and individual workers. Some schools work mainly through the student body asking each pupil to tell others of the work of the school.

The principal of the Tottenville Evening Trade School in reply to a question asking what methods he followed in securing pupils, gave the following list:

“(a) Circulars, (b) Newspapers, (c) Posters in factories, railroad stations and at ferry slips, (d) Items inserted in technical journals and in special bulletins and papers that are issued in the larger plants, (e) Slides in the moving picture houses, (f) Clubs, unions and schools and various civic bodies addressed in person by the principal, (g) Open evenings so that visitors may see what is being done in the shops and classes, (h) Exhibitions are held to which all the apprentices and journeymen are invited. Recently more than 1,500 attended such an exhibition. (i) News items inserted regularly in the local papers, (j) Personal visits made regularly to the nearby plants.” Nearly all of the principals recommended that a general publicity bureau be established at a central office to take charge of the advertising for all the evening school work.

Registration of Pupils: For more than ten years the city superintendent of schools has recommended that a small registration fee be charged pupils desiring to enter the evening school and this recommendation has been supplemented year after year by the district superintendent in charge of evening schools. No action has been taken by the Board of Education on this recommendation.

All principals of the evening trade schools among other questions were asked if they believed that a deposit fee should be required and also were asked their opinion regarding the size of the fee and under what conditions it should be returned. All agreed that a fee should be charged, one going so far as to state that it would do more than any other one thing to raise the work of the school. Their opinions in regard to the amount of the fee that should be required ranged from one dollar to ten dollars. With a single exception the principals agreed that the fee should be returned at the end of the term if the pupils' record for attendance and scholarship has been satisfactory.

The principals seemed to feel that more time should be allowed for the examination of the pupils in order that they might be

classified and graded more accurately. One principal stated that in his opinion it would be very desirable to have a teacher of each type of class present during the period of registration to confer with the pupils and help them to secure just the work they needed.

Popularity of Subjects: That some trade subjects attract more pupils than do other subjects is a fact that is well known to those who have had experience in the evening school work. The comparative popularity of subjects in the evening trade schools as shown by the number of classes and the average attendance for each trade group is shown in the table below.

TABLE SHOWING THE AVERAGE ATTENDANCE AND THE NUMBER OF CLASSES IN EACH OF THE TRADE GROUPS OF THE EVENING TRADE SCHOOLS:

	1914	1915	1915	1916
	Av. Att.	Av. No. Cl.	Av. Att.	Av. No. Cl.
Engine work	109	7.4	83	5.4
Printing trades	203	9.8	148	8
Metal work	239	12.2	205	10.4
Wood work	247	13.1	177	9.6
Women's occupations.....	306	14.5	221	9.2
Industrial arts	258	15.6	196	12.0
Electric trades	525	23.5	366	18.9
Industrial sciences	611	25.7	478	19.4
Special trades	459	28	357	22.8
Drawing and design.....	712	36.1	723	25.9

Establishment of Courses: When 15 or more persons desire a particular kind of trade instruction in a certain trade school, the principal of that school sends in a request that the class be established. If the superintendent in charge of the evening schools, or the board of examiners, do not feel that this is giving a course already established a new name, the request is granted and the class is authorized. The report for the evening schools for 1915-1916 lists over 70 different kinds of trade courses in which instruction was given that year.

Length of Courses: The evening trade schools are in session four nights a week for thirty weeks but no pupil is permitted to attend more than two nights a week. The schools are really duplicate schools, one section meeting on Monday and Wednesday nights and the other section on Tuesday and Thursday nights.



CLASS IN TEXTILE DESIGN—EVENING SCHOOL OF INDUSTRIAL ART

However, the pupils enrolled in the Evening School of Industrial Arts and the pupils in a few special classes in the other trade schools are allowed to attend four nights. Practically all the evening trade courses are sixty nights in length.

The limitation of attendance of the students to two nights a week has been in effect less than two years and has met with considerable opposition. Each of the principals of the evening trade schools was asked whether in his opinion his school was more or less effective because of the change. While most of the principals agreed that the two nights a week plan was an improvement, two of them were most emphatic in declaring that two nights a week do not afford sufficient time to do the work.

Organization of Evening Trade Classes: The wide range in previous school training and trade experience of the pupils in the evening trade classes make it a very difficult problem to so organize the classes as to do efficient work. Where the school sets up a definite course, or program, to meet a definite need, such as the operating of a special machine, or the passing of an examination necessary to secure a trade license, the pupils in attendance were quite evenly graded in regard to their occupations, training and experience. On the other hand where the course was not definite in aim, a wide diversity of occupations was shown.

Of the first type were the classes in lithography and garment design and most of the classes in machine shop practice and plumbing. Of the second type were many of the classes in drawing and electric wiring, the wood working classes and those in industrial science such as physics, chemistry and trade mathematics.

One class in shop mathematics was composed of one blacksmith, five machinists, one copy boy, four oilers, one errand boy, one grocery clerk, one engineer, one lathe hand, one restaurant man, one machinists' helper, one tailor, one elevator man, one clerk and one draftsman. On the night when the class was visited, the teacher was giving a lesson in sheet metal problems.

There were four office boys, one pattern maker's apprentice, three junior draftsmen, one bookkeeper, one mason, one plumber's helper, three clerks, one iron worker's helper and three carpenters registered in a course in architectural drawing. One man who was a plumber was interviewed with regard to the work which he was doing and he said he was working "problem

number twenty-three." Examination of his work showed that he had copied twenty-two geometrical problems.

Another example of diversity of occupations is shown in a class of cabinet making. This class was made up of one insurance man, one telephone repair man, three clerks, one cabinet maker, one bookbinder, two machinists, one baby carriage manufacturer, one press feeder, one shipwright, and one boy engaged in making blue prints. The work of this class consisted largely in making small pieces of furniture.

The distribution for each of the more largely attended trade classes is shown in the "Summary of Other Trade Groups" under the "Occupations of Students."

Size of Classes: Except in the case of the Tottenville Evening Trade School which has but a limited population upon which to draw and in special cases where the director of the evening school thinks it advisable to continue a class longer, a trade class is either combined or discontinued when the average attendance falls below 15 pupils. The table below shows the average attendance per class for each of the principal trade groups taught in the evening trade schools.

TABLE SHOWING AVERAGE ATTENDANCE

	1913-14	1914-15	1915-16
Wood work	15.4	18.9	18.4
Metal work	17.7	18.8	19.7
Electrical trades	21.9	22.3	19.4
Printing trades	22.5	20.7	18.5
Engine work	16.7	14.7	15.4
Special trades	15.7	16.4	19.5
Drawing	19.5	20.0	24.0
Women's occupations	20.2	21.1	16.3
Industrial art	16.9	16.5	

Courses of Study: No one topic has received so much space in recent years in the report of the district superintendent in charge of evening schools as has the course of study in the evening trade classes. The report on evening schools for the year 1911-1912 devotes 20 pages to a discussion of evening trade instruction in which it is advocated that "the utmost latitude should be allowed principals in modifying a course so that, so far as possible, the teaching may suit the needs of each learner whether he requires the knowledge of a whole course or only

certain specific parts of it." A list is given of 44 shorter courses in trade subjects to be given for the following year. The 1912-1913 report gives nine pages to "Industrial Education" in which the value of the short unit course is clearly set forth and a list given of 12 additional short courses that had been prepared for trade subjects. The 1913-1914 report was prepared during the interval between the resignation of Dr. Shiels and Mr. Jenkins' assignment to the work of the evening schools and consists largely of the statistical tables in regard to attendance. In his first report, that for the year 1914-1915, Mr. Jenkins in describing "Short Unit Courses in Trade Schools," says: "I feel that the success of the 'Short Unit Course' has not been what might have been different from the mechanical drawing taught in South account of the appointment of teachers and their continuation in service. We may need to vary these, but this form of trade course I believe to be so valuable and economic that next session special attention should be paid to its development and improvement." Some of the reasons given for the lack of success with the unit courses were: (1) that the attendance for a short unit course made a poor showing on the final annual report, (2) selecting the right men for the courses was a serious problem, (3) teachers are out of employment when a class disappears and naturally desire to hold a class for as long a period as possible, and (4) there is much difficulty in analyzing the subject matter of any trade course into short units.

In the Evening School Report for 1915-1916 Mr. Jenkins states: "I recommend during the coming season that short unit courses be thoroughly worked out. For this purpose it will be necessary to have standardized courses of study. The first step to be taken should be the sending out of a circular to all teachers with a request to prepare complete courses of study in their special subjects based upon their experience. Group conferences of the teachers of the various subjects should be held for the purpose of discussion and the organization of small committees to draw up standard courses of study. There is no reason in the world why mechanical drawing taught in Harlem should be different from the mechanical drawing taught in South Brooklyn."

During the session of 1916-1917, five years after the 44 shorter courses in trade subjects were worked out, the members of the survey staff were able to find but little results of the five years' agitation so far as short unit courses were concerned. The

courses in the Manhattan Evening Trade School for Women were all short unit courses of from 5 to 30 nights in length and have been since the opening of the school. In the Murray Hill Evening Trade School a 24-night course was offered in Kelly press operating and the courses in plan reading in some evening schools were short units arranged for the men of different grades.

The reply of one of the principals to a question in regard to the result of his experience with short unit courses sheds some light on why they are not being used more extensively.

"The short unit courses, in my opinion, are a pure bluff. Five years ago under the direction of Superintendent Shiels, three of the principals of the trade schools drafted the short course circular rather under protest and because of the country-wide demand and claim that it was the solution for the evening school problem. All of us who helped to draft that circular expressed to Mr. Shiels that the outlines suggested were no more than mere excerpts from the various syllabi given during the winter by the several teachers, and that on paper these short outlines might catch the eyes of interested individuals who might apply, become interested and, once enlisted in the course, we would hope to retain them. In New York City, with its diversified groups of specialized industries, none of which are certainly located or grouped in large individual concerns, we have never been able to find any real topic which could be listed as a short course to be taken by a suitably sized class."

This discussion of the short unit course is perhaps partly responsible for the fact that many excellent courses of study in trade subjects were found in the evening trade schools. With few exceptions each teacher visited was following a course of study which he had prepared and was aiming to cover a certain amount of this course each night. Being prepared individually however, there was little agreement between the courses of study in the same subject in the different schools.

Method of Selection, Tenure and Salary of Evening Trade School Teachers: The teachers of the evening trade schools, as in all other departments of the New York City school system, are appointed from an eligible list which is made by the board of examiners. The board of superintendents nominates from this list persons to fill such positions as are authorized by the Board of Education and their nominations are presented to the Board of Education for its approval. A teacher who has received an



CLASS IN MOTION PICTURE MECHANICS—MURRAY HILL, EVENING TRADE SCHOOL

appointment to teach in an evening trade school as well as all other evening schools, is rated by the principal of the school "for instruction, disciplining and ability to hold the class." The number of times he has been absent or tardy is also certified to by the principal at the end of the year. A teacher who has a satisfactory attendance record and whose teaching has not been called into question by the principal of the evening trade school, or the district superintendent, is replaced on the next season's list together with those teachers on the eligible list who were not reached and not appointed. The responsibility is placed upon the principal of the school for having satisfactory teachers as no teacher is re-appointed to an evening school unless the principal of that school desires his services.

The salary schedule for the evening trade schools is the same as that for the evening high school, all teachers receiving five dollars an evening.

Supervision of Evening Trade Classes: A fuel engineer in the department of supplies has been supervisor of the evening trade classes and trade equipment since October, 1914. His work is general in its nature and there has been no special supervision of the instruction given in the several trade groups other than the supervision which each of the evening school principals has been able to accomplish. The district superintendent in charge of the evening schools, replying to questions regarding the supervision of the evening trade classes, said: "The supervisor of the trade classes and trade equipment observes and inspects various kinds of trade classes and makes reports to me. The general supervision, however, of the trade classes is left to the principal who is a selected expert and presumably competent to supervise the work.

"At present I am satisfied with the amount of supervision that we have. Later I should like supervisors representing various general trades to work each a certain number of evenings in supervision. By general trades I mean one printing expert who would examine into all the classes that have anything to do with that trade. An expert supervisor of all machine work including forging and blacksmithing, etc., also supervisors and experts on electrical work."

The principals of the evening trade schools were divided on the subject of supervision. Some of them thought that this was

the work of the principal while others expressed the feeling that special supervisors were needed for each of the important trade subjects.

Advisory Committees from the Trades: In the report on the evening schools for the year 1911-12 several pages are devoted to the value of "Co-operative Agencies in Evening School Instruction." After discussing the desirability of co-operation with the employers of all who attend the evening schools, Dr. Shiels further says: "In the trades the sympathy and co-operation of the unions is equally necessary. An arrangement was made with the Pattern Makers' Union by which the Union agreed to direct its apprentices to attend a class in pattern making; the Union itself will co-operate with the principal and in conjunction with the Department of Education will certify to the proficiency of students; this arrangement will be carried out next season. It is possible that the Board of Education may extend the policy thus begun to other bodies whether of employers or employees." The report of the year 1912-1913 states: "The work provided for in the agreement between the Pattern Makers' Union and the Department of Education has been initiated and successfully continued so that the Brooklyn apprentices now attend evening school." The reports of the evening school for the next three years do not mention the subject.

One of the principals in replying to a question in regard to co-operation between the evening trade schools, the employers and unions made this statement: "Five years ago Superintendent Straubenmuller, five principals and fifteen representatives of the Pattern Makers' Union had at least two meetings at the Hall of the Board of Education the outcome of which was that thereafter all apprentices for pattern makers would be compelled to attend an approved school in the evenings for instruction in their subject during their complete apprenticeship of four years. At that time we felt that a very great step had been made in the co-operation, but I believe because the Union could not have its choice as to teachers named in the several schools no interest whatever was taken in sending apprentices to our schools."

The district superintendent in charge of evening schools, was asked if he considered it advisable, or possible, to secure the co-operation of employers' associations and unions in developing evening trade school courses of study and to what extent he had been able to secure this co-operation. In reply he stated: "It



CLASS IN GARMENT DESIGNING—MURRAY HILL EVENING TRADE SCHOOL

is in the highest degree advisable and it is entirely possible to secure the co-operation of employers' associations and unions in developing evening trade school courses of study. The Murray Hill Evening Trade School represents excellent work in this direction and those schools which do not have it owe it to the lack of effort, or properly directed effort, of the one in charge of the school. The Evening School of Industrial Arts, the Murray Hill Evening Trade School, the Brooklyn Technical and Trade and the Harlem Evening Trade are fine examples of the extent to which we have been able to secure this co-operation and the results are due entirely to the efforts of the principals. My share is confined to suggestion and the encouragement of the principal."

These questions have been included to show that the matter of advisory committees has been left to the principal of the evening trade school. In a restricted occupation, such as lithography, where the work is confined to a single trade school and the instruction is highly specialized, the co-operation between the employers, the union and the school is very marked. In the Evening School of Industrial Arts the subjects taught, such as book illustrating, mural decoration and designing for stained glass, jewelry and posters are for small groups of workers. In this school each department has a board of advisors who are practical men, active in their respective trades. In the large work of the evening trade schools where subjects, such as electrical work, machine shop practice, printing, etc., are taught in several different schools, neither the employers as represented by their association, nor the employees as represented by their unions, have influenced to any appreciable extent the kind of instruction that is offered in the evening trade schools.

Study of the Evening Trade School Pupils: A questionnaire was prepared by the survey staff that was filled out by over 4,500 men and women who were attending the evening trade classes. The number of men who filled out the blanks for the most largely attended trades is given in the following table:

TABLE SHOWING NUMBER OF MEN IN EACH TRADE WHO RE-
PLIED TO QUESTIONS ASKED OF THOSE ATTENDING
EVENING TRADE CLASSES

Electric Wiring	495
Mechanical Drawing	452
Machine Shop Practice	418
Printing	367
Plumbing	287
Garment Design	211
Automobile Repair	197
Carpentry and Joinery.....	90
Cabinet Making	79
Pattern Making	54

Since a larger number of reports were received from the men attending the classes in electric wiring than from those attending any of the other trade classes and also because electric wiring was one of the four trades of which a special survey was being made, a summary of the answers of the men in this trade is given in this report of the evening school. In another section will be found the summary for some of the other trades.

DESCRIPTION OF THE MEN ATTENDING EVENING CLASSES IN
ELECTRIC WIRING

Ages of Students

14 years.....	7	20 years.....	39
15 years.....	19	21 to 25 years.....	96
16 years.....	49	25 to 30 years.....	34
17 years.....	80	30 to 35 years.....	19
18 years.....	72	35 to 40 years.....	11
19 years.....	51	40 years and over.....	11

It will be seen that more than half of the men attending these classes are not over 19 years of age. Half of those attending the classes in mechanical drawing were 18 years of age or younger. In the machine shop classes and the plumbing classes those who were 21 years of age needed to be taken to include half of the class and in the classes in garment design and carpentry and joinery the middle division came at 24 years.

Nationality and Parentage of Students: In the electric wiring classes 103 were native born of native parentage, 226 were

native born of foreign or mixed parentage, and 166 were foreign born. The distribution of the men according to nationality in the other trade classes (with the exception of garment design where nine-tenths of the men were foreign born) did not differ widely from that of the men in the electric wiring classes. Speaking in general terms, 17 per cent. of the men in the evening trade classes were native born, 42 per cent. were native born of foreign or mixed parentage and 41 per cent. were foreign born.

Previous School Training: The grade which the men attending the evening electric wiring classes had reached in the day school was given by them as follows:

Grade Completed by Men Attending Electric Wiring:

Classes below 6th grade.....	27	1st year in high school.....	11
Sixth grade.....	40	2nd year in high school.....	12
Seventh grade.....	116	3rd year in high school.....	3
Eighth grade.....	49	4th year in high school.....	3
Eighth grade graduate.....	209	High school graduates.....	1

Half of the men in the electric wiring classes who answered this question had finished the eighth grade, but only six percent of them had had any high school training.

In no other class, with the exception of printing, where 50 percent of the men had completed the eighth grade and in mechanical drawing, where 60 percent of the men were elementary school graduates, had so large a percentage of the men attending the evening classes reached as high a grade in the day school. In the machine shop and cabinet making classes more than half of the men had left school before finishing the eighth grade, and in carpentry and joinery and plumbing, half of the men had not gone further than the seventh grade before going to work.

Occupations of the Men: Under the organization of the evening school system which went into effect with the opening of the winter session on January 3, 1916, only those actually engaged in the trade in which instruction was desired were to be admitted to the evening trade classes. The occupations as given by 487 of the men in the electrical classes are given below:

Note—Many of the men in attendance in the trade classes failed to answer all questions on the questionnaire and as a result the totals do not check.

Occupations of the Men Attending Electric Wiring Classes:

Asst. Engineer	1	Machinist	12
Auto Engineer	3	Mechanic	9
Brush Maker	1	Organ Builder	2
Clerks	49	Packer	1
Clothing	4	Perfumer	1
Chauffeur	3	Photography	1
Cutter	1	Picture Framing	1
Carpenter	3	Piano Maker	2
Driver	2	Plumber	1
Draftsman	1	Porter	5
Electricians		Printing	6
Journeyman	34	Press Hand	1
Helpers	220	Repair Man	1
Apprentices	60	Roofer	1
Elec. Machinist	3	Salesmen	2
Elec. Supplies	2	Shopwork	1
Electro Plater	1	Silversmith	1
Elevator Operator	6	Stationery Engineer	4
Elevator Repair	5	Steam Engineer	1
Engineer	3	Surgical Instruments	1
Errand Boy	1	Telephone Operator	5
Expressman	1	Telephone Installation	3
Houseman	2	Tinsmith	1
Instrument Maker	3	Trunk M'fg.	1
Janitor	8	Typist	1
Laborer	1	Waiter	1
Laundry	1	Wireman	1
Longshoreman	1		

As will be noted in the table above, about three-fifths of the men gave their occupation as electricians, although it is probable that a number working part or all their time at electrical work in some industrial plant gave the industry as their occupation rather than electrical work.

This wide range of occupations was noted in other trade classes showing the great difficulty that has been encountered in making these classes entirely trade extension work. The classes in mechanical drawing registered men from over 60 different occupations, 63 of the men stating that they were clerks. Twelve of the 79 men in the cabinet making classes stated that they were cabinet makers and 29 others were in allied wood working trades as carpenters, boat builders, etc. Of the 419 men in the machine shop classes who gave their occupations, 350 stated that they were machinists and 28 more were metal workers. All but

five of the men in the plumbing classes stated that they were plumbers and all but five of the men in the garment design classes were tailors working at the garment trade as cutters, operators, etc.

Number of Years Worked at Trade: Each man was asked how many years he had worked at the trade, the object of the question being to determine whether the evening school was most attractive to apprentices, helpers or journeymen. This information for the electrical classes is given in the table below:

Number of Years Worked at the Trade:

One year.....	236	Six to ten years.....	36
Two years	85	Ten to fifteen years.....	7
Three years	32	Fifteen to twenty years.....	2
Four years	32	Twenty years or over.....	1
Five years	26		

As will be seen from the above table practically half of the men attending the electric wiring classes were working the first year at the trade, and, as was given in the table on occupations, only 34 men stated that they were journeymen. Also in mechanical drawing, and automobile work, half of the men in the classes were working the first year at the trade. About one-third of those attending the machine shop and cabinet making classes, one-fourth of the men in the carpentry classes, one-fifth of the men in plumbing stated that they had worked a year or less at the trade. These facts in regard to the number of years the men have worked at the trade, taken in connection with the age of those attending the evening classes and the number of men enrolled for each trade subject, seem to show that the large enrollment for the classes in electrical wiring and mechanical drawing is because the classes in these two subjects are filled largely with boys and young men whose experience and knowledge of the trade are very limited.

Length of Working Day: Most of the men attending the evening trade classes work eight hours a day, although the nine-hour day is not uncommon. The table below shows the distribution in regard to the number of hours worked each day by the men in the five largest trade groups.

Showing Length of Working Day of Men Enrolled in Evening Trade Classes:

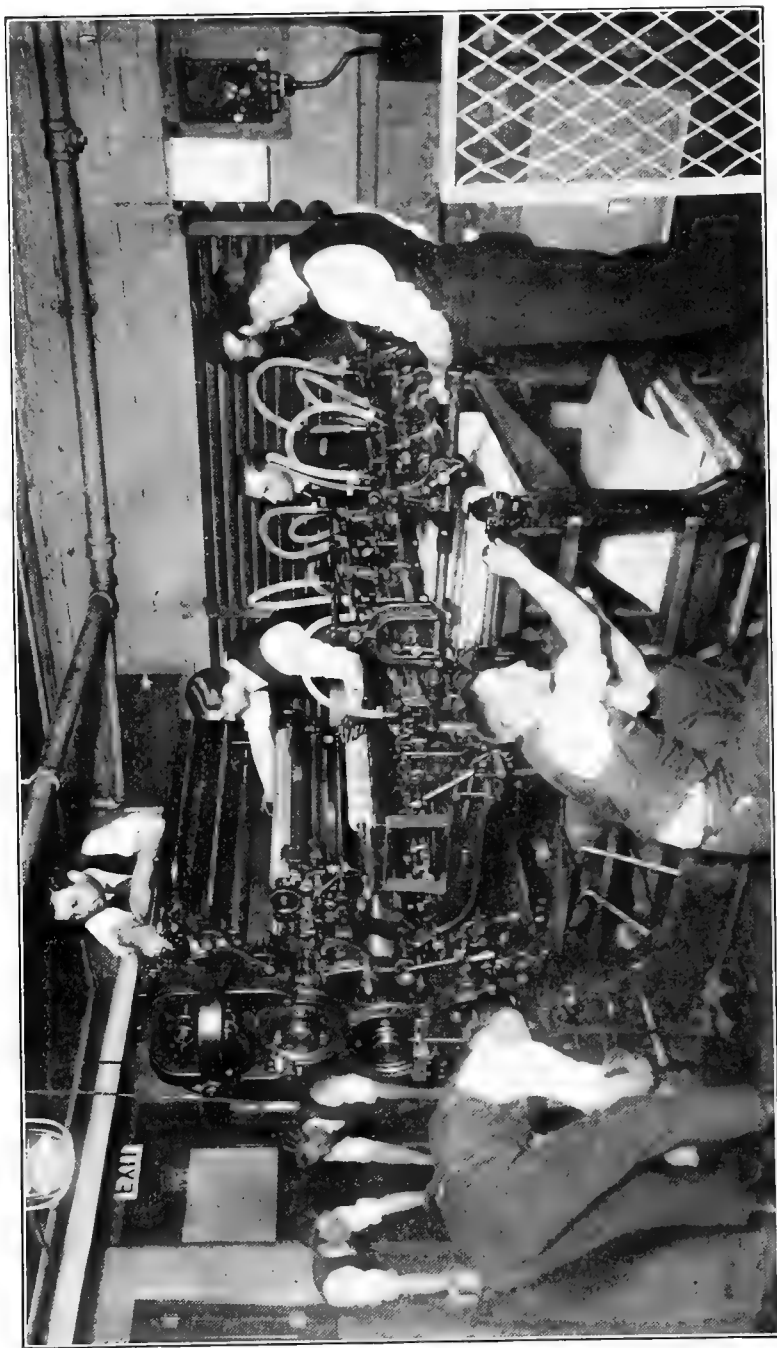
	8 hours	9 hours	10 hours
Electric Wiring	277	151	59
Mechanical Drawing	239	168	32
Machine Shop	170	198	30
Plumbing	272	8	2
Garment Design	44	158	8
Total	1002	683	131

Weekly Wages: Although no effort was made to determine the accuracy of the replies the men made to this question, the information is illuminating in showing how many men attending the evening trade classes are receiving the wages of apprentices and helpers and how few are receiving the wage of a journeyman. Not all of the men attending the evening classes answered the question, some of them feeling that the wage they received was more personal than the other questions on which information was sought.

The information concerning the wages of the men in the electric wiring classes is tabulated below:

Weekly Wage	Number	Weekly Wage	Number
\$ 2.50 to \$ 5.00.....	14	\$15.00 to \$17.50.....	21
5.00 to 7.50.....	66	17.50 to 20.00.....	20
7.50 to 10.00.....	148	20.00 to 22.50.....	12
10.00 to 12.50.....	68	22.50 to 25.00.....	8
12.50 to 15.00.....	86	25.00 to 30.00.....	6

It will be seen that over half of the men attending the electric wiring classes receive less than ten dollars a week and less than six percent of the men in these classes receive as much as \$20 a week. The men attending the mechanical drawing classes were earning even less. Fifty-three percent of these men were earning less than ten dollars a week, and but seven percent were earning \$20 a week and over. It had previously been noted that the men attending the classes in plumbing, machine shop practice and carpentry were older than the men attending the electric wiring and mechanical drawing classes and had worked years at the trade. This was reflected in the wages given. About 37 percent of those attending the plumbing classes received less than ten dollars a week and thirteen percent receive more than twenty dollars. Of the men in the machine shop classes about one-fourth earned less than ten dollars a week and 16 percent



CLASS IN THE MECHANICS OF THE OFFSET PRINTING PRESS—MURRAY HILL EVENING TRADE SCHOOL

earned \$20 a week and over. Twenty percent of those who filled out the blanks in the carpentry classes stated that they were earning less than \$10 a week and 25 per cent gave their weekly wage at \$20 or more.

Length of Attendance: The teachers of the evening trade classes furnished the number of evenings each of the 4,500 men had attended during the term in order that the length of time the average man will remain in an evening trade school might be determined. Most of those who come have a definite reason for attending. If they secure the kind of work they desire they leave as soon as they have attained the object of their coming. If they fail to find just what they are looking for they leave all the sooner. The number of nights of attendance of the men in the seven largest trade groups is shown in the table below :

	Electric Wiring	Mechanical Drawing	Machine Shop	Garment Design	Auto Repair	Carpentry & Joinery	Plumbing.
1 to 5 nights.....	15	34	13	5	9	3	5
5 to 10 nights.....	13	33	28	11	19	4	24
10 to 15 nights.....	25	39	45	12	26	6	38
15 to 20 nights.....	32	39	46	29	32	17	29
20 to 30 nights.....	75	33	79	73	57	21	44
30 to 40 nights.....	132	85	88	71	66	17	76
40 to 50 nights.....	166	104	100	34	25	29	56
50 to 60 nights.....	20	25	13	2	1	3	10
Total	478	392	412	237	235	100	282

It will be noted that half of the men in the plumbing, electric wiring and mechanical drawing classes attended for 30 or more nights, but in the other trade subjects listed in the table less than half of the men were present for over 30 nights.

SUMMARY OF OTHER TRADE GROUPS

The following tables show certain significant facts concerning the ages, birthplace, previous school training, occupations, years worked at the trade, length of working day, weekly wages, and attendance of those enrolled in the larger trade classes.

These tables are presented in order that the reader may secure some idea of the training and experience of pupils enrolled in the evening trade schools.

MECHANICAL DRAWING CLASSES

AGES

14 years.....	9	21 to 25 years.....	69
15 years.....	39	25 to 30 years.....	21
16 years.....	72	30 to 35 years.....	9
17 years.....	91	35 to 40 years.....	9
18 years.....	52	40 to 45 years.....	1
19 years.....	47	45 years or over.....	1
20 years	36		

PLACE OF BIRTH AND PARENTAGE

Native born—Native parentage.....	93
Native born—Foreign or mixed parentage.....	220
Foreign born.....	139
	452

PREVIOUS SCHOOL TRAINING

Day School

Below 6th grade.....	10	1st year high school.....	27
6th grade.....	35	2nd year high school.....	23
7th grade.....	77	3rd year high school.....	3
8th grade.....	50	4th year high school.....	5
8th grade graduate.....	190	High school graduates.....	0

Night School

General Courses

Trade Courses

1 year.....	42	1 year.....	67
2 years.....	10	2 years.....	10
3 years.....	4	3 years.....	7

OCCUPATIONS

Machinists:

Apprentices	69
Helpers	85
Journeyman	73
Machine Hands.....	12
Mechanics	6
Electricians	11
Engineers	3
Piano Manufacturers.....	4
Clerical Work.....	63
Blacksmiths	7
Craftsmen	18
55 other occupations.....	105

475

MECHANICAL DRAWING CLASSES—Continued

NUMBER OF YEARS WORKED AT TRADE

1 year.....	234	6 to 10 years.....	45
2 years.....	64	10 to 15 years.....	13
3 years.....	33	15 to 20 years.....	7
4 years.....	26	20 to 25 years.....	5
5 years.....	17		

LENGTH OF WORKING DAY

8 hours.....	239	9 hours.....	168	10 hours.....	32
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WEEKLY WAGES

\$2.50 to \$5.00.....	16	\$20.00 to \$22.50.....	10
5.00 to 7.50.....	91	22.50 to 25.00.....	13
7.50 to 10.00.....	111	25.00 to 27.50.....	3
10.00 to 12.50.....	50	27.50 to 30.00.....	4
12.50 to 15.00.....	45	30.00 to 32.50.....	0
15.00 to 17.50.....	25	32.50 to 35.00.....	0
17.50 to 20.00.....	46	Over 35.00.....	1

LENGTH OF ATTENDANCE

1 to 5 nights.....	34	30 to 40 nights.....	85
5 to 10 nights.....	33	40 to 50 nights.....	104
15 to 20 nights.....	39	50 to 60 nights.....	11
10 to 15 nights.....	39	Over 60 nights.....	14
20 to 30 nights.....	83		

MACHINE SHOP CLASSES

AGES

14 years.....	1	21 to 25 years.....	119
15 years.....	8	25 to 30 years.....	73
16 years.....	19	30 to 35 years.....	25
17 years.....	35	35 to 40 years.....	21
18 years.....	49	40 to 45 years.....	3
19 years.....	32	45 years or over.....	3
20 years.....	34		

PLACE OF BIRTH AND PARENTAGE

Native born—Native parents.....	52
Native born—Foreign or mixed parentage.....	180
Foreign born.....	186

418

PREVIOUS SCHOOL TRAINING

Day School

Below 6th Grade.....	37	1st year high school.....	9
6th grade.....	44	2nd year high school.....	9
7th grade.....	74	3rd year high school.....	7
8th grade.....	64	4th year high school.....	2
8th grade graduates.....	132	High school graduates.....	2

MACHINE SHOP CLASSES—Continued

PREVIOUS SCHOOL TRAINING—Continued

Evening School

General Courses		Trade Courses	
1 year.....	69	1 year.....	41
2 years.....	26	2 years.....	20
3 years.....	11	3 years.....	9
4 years.....	2		
5 years.....	1		
6 years.....	1		

OCCUPATIONS

Machinists:

Apprentices	45
Helpers	95
Journeyman	160
Bench Hands.....	17
Machine Hands.....	28
Metal Workers.....	23
Auto Mechanics.....	5
Draftsmen	4
Mechanics	3
Cabinet Makers.....	3
Tool and Instrument Makers.....	13
19 other occupations.....	34
	430

NUMBER OF YEARS WORKED AT TRADE

1 year.....	145	6 to 10 years.....	64
2 years.....	61	10 to 15 years.....	22
3 years.....	50	15 to 20 years.....	11
4 years.....	37	20 to 25 years.....	3
5 years.....	30	25 years or over.....	1

LENGTH OF WORKING DAY

8 hours.....	170	9 hours.....	198	10 hours.....	30
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WEEKLY WAGES

\$2.50 to \$5.00.....	7	\$20.00 to \$22.50.....	33
5.00 to 7.50.....	22	22.50 to 25.00.....	26
7.50 to 10.00.....	85	25.00 to 27.50.....	3
10.00 to 12.50.....	55	27.50 to 30.00.....	5
12.50 to 15.00.....	78	30.00 to 32.50.....	1
15.00 to 17.50.....	51	32.50 to 35.00.....	1

LENGTH OF ATTENDANCE

1 to 5 nights.....	13	20 to 30 nights.....	79
5 to 10 nights.....	28	30 to 40 nights.....	88
10 to 15 nights.....	45	40 to 50 nights.....	100
15 to 20 nights.....	46	50 nights or over.....	13

PLUMBING CLASSES

AGES

15 years.....	3	21 to 25 years.....	100
16 years.....	12	25 to 30 years.....	29
17 years.....	35	30 to 35 years.....	8
18 years.....	34	35 to 40 years.....	6
19 years.....	23	40 to 45 years.....	3
20 years.....	30	45 years or over.....	3

PLACE OF BIRTH AND PARENTAGE

Native born—Native parentage.....	48
Native born—Foreign or mixed parentage.....	133
Foreign born.....	106

287

PREVIOUS SCHOOL EXPERIENCE

Day School

Below 6th grade.....	33	1st year high school.....	2
6th grade.....	24	2nd year high school.....	4
7th grade.....	77	3rd year high school.....	1
8th grade.....	41	4th year high school.....	1
8th grade graduates.....	67	High school graduates.....	2

General Evening School Work

1 year.....	39
2 years.....	12
3 years.....	3
4 years.....	1

Evening Trade School Work

1 year.....	33
2 years.....	10
3 years.....	6

OCCUPATIONS

Employers.....	2
Pipe Fitters.....	3
Plumbers:	
Apprentices.....	15
Helpers.....	193
Journeymen.....	63
Metal Workers.....	1
Stationary Engineer.....	1
Civil Engineer.....	1
Clerk.....	1
Jewelry.....	1

281

NUMBER OF YEARS WORKED AT TRADE

1 year.....	64	6 to 10 years.....	45
2 years.....	58	10 to 15 years.....	11
3 years.....	40	15 to 20 years.....	4
4 years.....	34	20 years or over.....	3
5 years.....	32		

PLUMBING CLASSES —Continued

LENGTH OF WORKING DAY

8 hours.....	272	9 hours.....	8	10 hours.....	2
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WEEKLY WAGES

\$2.50 to \$5.00.....	5	\$20.00 to \$22.50.....	16
5.00 to 7.50.....	15	22.50 to 25.00.....	8
7.50 to 10.00.....	82	27.50 to 30.00.....	0
10.00 to 12.50.....	62	30.00 to 32.50.....	8
15.00 to 17.50.....	10	32.50 to 35.00.....	1
17.50 to 20.00.....	35	Over \$35.00.....	1

LENGTH OF ATTENDANCE (TO MARCH 28, 1917)

1 to 5 nights.....	5	20 to 30 nights.....	44
5 to 10 nights.....	24	30 to 40 nights.....	76
10 to 15 nights.....	38	40 to 50 nights.....	56
15 to 20 nights.....	29	Over 50 nights.....	10

GARMENT DESIGN CLASSES

AGES

17 years.....	5	25 to 30 years.....	57
18 years.....	8	30 to 35 years.....	23
19 years.....	8	35 to 40 years.....	18
20 years.....	9	40 to 45 years.....	5
21 to 25 years.....	97	45 years and over.....	3

PLACE OF BIRTH AND PARENTAGE

Native born—Native parents.....	1
Native born—Foreign or mixed parentage.....	26
Foreign born	184

211

PREVIOUS SCHOOL TRAINING

Day School

Large percentage attended school abroad; records incomplete.

Evening School

General Courses

Trade Courses

1 year.....	60	1 year.....	7
2 years.....	17	2 years.....	1
3 years.....	18		
4 years.....	4		
5 years.....	3		

OCCUPATIONS

Tailors	87
Cutters	97
Operators	38
Waist Making	6

GARMENT DESIGN CLASSES—Continued

OCCUPATIONS—Continued

Hatters	18
Clerks	2
Foremen	2
Furrier	1
Hair Goods.....	1
Pattern Designer	1
Chauffeur	1
	254

NUMBER OF YEARS WORKED AT TRADE

1 year.....	10	6 to 10 years.....	82
2 years.....	16	10 to 15 years.....	43
3 years.....	27	15 to 20 years.....	8
4 years.....	21	20 to 25 years.....	7
5 years.....	16	25 and over.....	3

LENGTH OF WORKING DAY

8 hours.....	44	9 hours.....	158	10 hours.....	8
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WEEKLY WAGES

\$5.00 to \$7.50.....	2	\$20.00 to \$22.50.....	149
7.50 to 10.00.....	12	22.50 to 25.00.....	12
10.00 to 12.50.....	17	25.00 to 27.50.....	24
12.50 to 15.00.....	41	27.50 to 30.00.....	15
15.00 to 17.50.....	17	30.00 and over.....	1
17.50 to 20.00.....	60		

LENGTH OF ATTENDANCE

1 to 5 nights.....	5	20 to 30 nights.....	73
5 to 10 nights.....	11	30 to 40 nights.....	71
10 to 15 nights.....	12	40 to 50 nights.....	34
15 to 20 nights.....	29	50 to 60 nights.....	2

AUTOMOBILE WORK CLASSES

AGES

14 years.....	7	21 years to 25.....	53
15 years.....	6	25 years to 30.....	25
16 years.....	14	30 years to 35.....	23
17 years.....	16	35 to 40 years.....	14
18 years.....	21	40 to 45 years.....	9
19 years.....	21	45 to 50 years.....	3
20 years.....	14	50 years or over.....	3

PLACE OF BIRTH AND PARENTAGE

Native born—Native parentage.....	49
Native born—Foreign or mixed parentage.....	94
Foreign born	54

AUTOMOBILE WORK CLASSES—Continued

PREVIOUS SCHOOL TRAINING

Day School			
Below 6th grade.....	16	1st year high school.....	24
6th grade.....	17	2nd year high school.....	8
7th grade.....	41	3rd year high school.....	1
8th grade.....	26	4th year high school.....	1
8th grade graduates.....	56	High school graduates.....	7

Evening School

General Courses:		Trade Courses:	
1 year.....	29	1 year.....	55
2 years.....	5	2 years.....	3
3 years.....	1	3 years.....	3
4 years.....	1	4 years.....	1
5 years.....	1		

OCCUPATIONS

Auto-Repairmen	61
Machinists	50
Chauffeurs	12
Clerks	21
Mechanics	23
Electricians	7
20 other occupations.....	24

198

NUMBER OF YEARS WORKED AT TRADE

1 year.....	89	6 to 10 years.....	19
2 years.....	33	10 to 15 years.....	15
3 years.....	19	15 to 20 years.....	4
4 years.....	11	20 to 25 years.....	3
5 years.....	15	25 years or over.....	2

WEEKLY WAGES

\$2.50 to \$5.00.....	8	\$20.00 to \$22.50.....	6
5.00 to 7.50.....	21	22.50 to 25.00.....	10
7.50 to 10.00.....	20	25.00 to 27.50.....	3
10.00 to 12.50.....	30	27.50 to 30.00.....	1
12.50 to 15.00.....	28	30.00 to 32.50.....	0
15.00 to 17.50.....	14	32.50 to 35.00.....	3
17.50 to 20.00.....	22	35.00 or over.....	1

LENGTH OF ATTENDANCE

1 to 5 nights.....	9	20 to 30 nights.....	57
5 to 10 nights.....	19	30 to 40 nights.....	66
10 to 15 nights.....	26	40 to 50 nights.....	25
15 to 20 nights.....	32	50 to 60 nights.....	1

CARPENTRY AND JOINERY CLASSES

AGES

16 years.....	3	21 to 25 years.....	21
17 years.....	4	25 to 30 years.....	19
18 years.....	10	30 to 35 years.....	13
19 years.....	10	35 to 40 years.....	9
20 years.....	4	40 years or over.....	3

PLACE OF BIRTH AND PARENTAGE

Native born—Native parentage.....	15
Native born—Foreign or mixed parentage.....	31
Foreign born.....	44

90

PREVIOUS SCHOOL TRAINING

Day School

Below 6th grade.....	8	1st year high school.....	2
6th grade.....	7	2nd year high school.....	1
7th grade.....	28	3rd year high school.....	1
8th grade.....	10	4th year high school.....	1
8th grade graduates.....	24	High school graduates.....	3

Evening School

General Courses:

Trade Courses:

1 year.....	8	1 year.....	20
2 years.....	4	2 years.....	6
3 years.....	2	3 years.....	2
		4 years.....	1

14

29

OCCUPATIONS

Carpenters	36
Cabinet Makers.....	3
Ship Carpenters.....	2
Piano Makers.....	3
18 other occupations.....	28

72

NUMBER OF YEARS WORKED AT TRADE

1 year.....	21	5 years.....	6
2 years.....	13	6 to 10 years.....	18
3 years.....	9	10 to 15 years.....	12
4 years.....	6	15 to 20 years.....	6

LENGTH OF WORKING DAY

8 hours.....	47	9 hours.....	35	10 hours.....	8
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CARPENTRY AND JOINERY CLASSES—Continued

WEEKLY WAGES

\$2.50 to \$5.00.....	1	\$20.00 to \$22.50.....	7
5.00 to 7.50.....	3	22.50 to 25.00.....	6
7.50 to 10.00.....	15	25.00 to 27.50.....	3
10.00 to 12.50.....	11	27.50 to 30.00.....	3
12.50 to 15.00.....	24	30.00 to 32.50.....	2
15.00 to 17.50.....	4	32.50 to 35.00.....	1
17.50 to 20.00.....	11		

LENGTH OF ATTENDANCE

1 to 5 nights.....	3	20 to 30 nights.....	21
5 to 10 nights.....	4	30 to 40 nights.....	17
10 to 15 nights.....	6	40 to 50 nights.....	29
15 to 20 nights.....	17	50 nights and over.....	3

CABINET MAKING CLASSES

AGES

16 years.....	4	21 to 25 years.....	15
17 years.....	9	25 to 30 years.....	10
18 years.....	11	30 to 35 years.....	4
19 years.....	7	35 to 40 years.....	3
20 years.....	9	40 to 45 years.....	1
		45 years or over.....	4

PLACE OF BIRTH AND PARENTAGE

Native born—Native parentage.....	19
Native born—Foreign or mixed parentage.....	37
Foreign born.....	23

79

PREVIOUS SCHOOL TRAINING

Below 6th grade.....	3	1st year high school.....	..
6th grade.....	9	2nd year high school.....	4
7th grade.....	13	3rd year high school.....	2
8th grade.....	11	4th year high school.....	2
8th grade graduates.....	27	High school graduates.....	3

OCCUPATIONS

Cabinet Makers.....	12
Wood Workers.....	15
Carpenters.....	7
Machinists.....	5
Boat Builders.....	3
Piano Makers.....	2
Clerks.....	12
Ship Wrights.....	2
Shop Teachers.....	4
15 other occupations.....	16

78

CABINET MAKING CLASSES—Continued

NUMBER OF YEARS WORKED AT TRADE

1 year.....	28	6 to 10 years.....	8
2 years.....	11	10 to 15 years.....	3
3 years.....	10	15 to 20 years.....	2
4 years.....	10	20 to 25 years.....	1
5 years.....	4		

WEEKLY WAGES

\$5.00 to \$7.50.....	4	\$17.50 to \$20	6
7.50 to 10.00.....	17	20.00 to 22.50	
10.00 to 12.50.....	7	22.50 to 25.00	
12.50 to 15.00.....	11	25.00 to 27.50	
15.00 to 17.50.....	3		

LENGTH OF ATTENDANCE

5 to 10 nights.....	1	20 to 40 nights.....	20
10 to 15 nights.....	8	40 to 50 nights.....	40
15 to 20 nights.....	6	50 nights or over.....	1
20 to 30 nights.....			

CHARACTER OF SHOP INSTRUCTION

Electrical Work: The members of the survey staff visited twenty-five evening classes in electrical work. Of this number eighteen were classes in electrical wiring and installation, five were classes in the theory of electrical work and two were classes in motor work.

As was pointed out in the description of the work of the evening electrical classes, over 50 percent of the men enrolled in these classes were 19 years of age or under, and practically 50 percent of them had worked one year or less at the trade. Not one class visited was made up entirely of electricians and no attempt was made to put apprentices, helpers and journeymen in separate classes. One class in advanced electrical wiring that was visited was made up of 8 clerks, 1 brush maker, 11 electricians, 2 engineers, 1 electrical operator and 1 waiter. Another class, one in electrical installation, was made up of 1 piano maker, 2 housemen, 1 plumber, 1 clothing maker, 1 mechanic in power house, 1 carpenter, 3 clerks, 1 wireman, 1 elevator operator, 4 electricians, 2 organ builders, 1 stationary engineer, 1 shop worker.

The work in electric wiring and installation consisted largely of working out simple problems in bell and light wiring. The instructors usually had a definite set of problems that the

pupils followed and they also gave lectures on materials, the theory of electrical problems, and the Board of Underwriters' requirements. The work was largely individual in character, due to the fact that the previous experience of the pupil was so varied. Several of the classes could not be considered trade extension classes.

The classes in electrical theory were made up of men from several occupations. One class visited registered 11 electricians, 3 electrical machinists, 1 clerk, 1 steam fitter, one salesman, 1 driver, 1 auditor, 1 leather worker and 1 engineer. The courses were general in character and not planned to meet the practical need of special groups of trade workers.

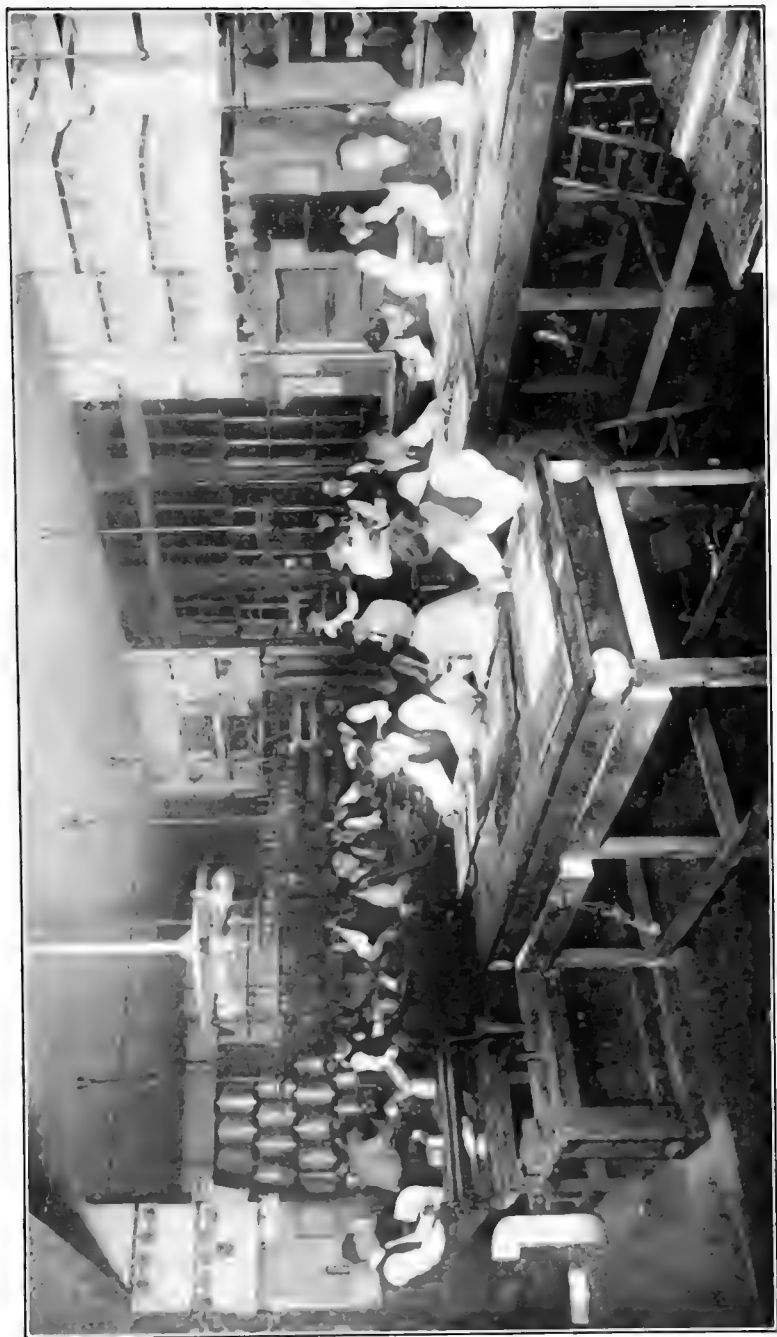
The instruction in electrical shop work was the farthest removed from real trade extension of any of the shop instruction noted in the evening trade schools. This was due to the fact that it is impossible to do much construction work in a school laboratory or shop as well as to the fact the classes were poorly organized and that a large percent of the pupils enrolled in the classes had worked a year or less at the trade.

Plumbing: Ninety-seven per cent of the men in attendance in the twelve plumbing classes visited were working at the plumbing trade during the day. Nearly all of these men attended the evening classes to learn how to wipe joints. The instruction was individual and an attempt was made to give each man the kind of work he wanted.

All the instructors gave lectures on the theory of plumbing, building code requirements and materials. In two classes it was noted that the instructors were teaching the pupils how to read blue prints. One instructor had worked out forty lesson sheets which were given to the men to study at home.

Machine Shop Practice and Theory: Twenty-one classes in machine shop practice and theory were visited by members of the survey staff. Four of these classes were in the theory of machine shop work and seventeen in machine shop practice. Approximately ninety percent of the men enrolled in these classes were working at machine or allied trades during the day.

All the instruction in machine shop practice was individual in character and planned to meet the individual needs of the pupils. This was necessarily modified where the equipment was



SHEET METAL DEPARTMENT—HARLEM EVENING TRADE SCHOOL

limited. Large numbers of pupils desired instruction in milling machine work, but the limited equipment prevented the schools from accommodating all of the applicants. In nearly all the classes visited the men were working from blue prints or free-hand sketches and usually worked out the mathematics connected with their problems. In one school the pupils were building a lathe, in the other schools the work consisted largely of exercises.

Many men were interviewed as to the value of the evening school work and nearly every man stated that the work was very helpful. The only men who were not satisfied were those in the elementary machine shop who were waiting for an opportunity to get into the advanced machine shop.

The courses in the theory of machine shop work consisted of lectures on machines, materials, shop methods and processes, and allied subjects. The men were also given some work in related mathematics and in blue print reading. The instructors were spending part of their time taking up the individual problems of the men and using them for class problems. The courses were well planned and the men took an active interest in the work. There were no machines or materials available in these classes for demonstration purposes.

Carpentry and Joinery: There were 90 men in attendance in the seven classes in carpentry and joinery at the time of the survey. Of the number that gave information concerning their occupation there were 36 carpenters, 3 cabinet makers, 2 ship carpenters, 3 piano makers and 28 men engaged in 18 other occupations. In three classes visited a few pupils were working on problems at stair building and framing; the other pupils were working on cabinet work or making pieces of furniture. In the four other classes visited the work consisted largely of making furniture to be taken home.

Mechanical Drawing: The twenty classes in mechanical drawing in the evening trade schools were visited by members of the survey staff. As pointed out in another part of this report, over fifty percent of the 464 pupils in attendance in the mechanical drawing classes, at the time of the survey, were under 19 years of age, and over half of the pupils were working the first year at their trade.

Very little attempt seems to have been made to group the men of one trade together. In one school with three Monday and Wednesday night classes in mechanical drawing, there were twenty-nine machinists registered in one class, seven machinists in another and nine in the third class. There were twenty-seven other students, representing fourteen other occupations in these three classes. In another school with three classes in mechanical drawing on Tuesday and Thursday nights there were thirty-six machinists in attendance in the three classes. Eighteen machinists were in one class, fourteen were in another and four in the third section. Twenty-three students representing twelve other occupations were in attendance in these classes. In still another school one instructor was teaching a class made up of 20 machinists, 5 clerks, 2 auto mechanics, 2 draftsmen, 1 laborer, 1 pattern maker, 1 jeweler and 1 sheet metal worker.

The smallest number of occupations represented in any one class in mechanical drawing at the time of the survey was five, the largest ten. The organization of these classes made it difficult for the instructors to plan the work to meet the needs of all the pupils. The work in mechanical drawing was so varied in content and method that it is difficult to describe. In some classes the pupils were making free-hand sketches from models and developing mechanical drawings from the sketches; in other classes the pupils were copying drawings from blue prints and books, and in still other classes the boys were working from blackboard sketches.

Industrial Science: The classes in chemistry, physics and mathematics, including such as are called industrial chemistry, applied physics and shop mathematics or trade mathematics, are all called industrial science. Classes in these subjects are organized in the Stuyvesant, Brooklyn and Bushwick Evening Trade Schools. The problems confronting the teacher of any of these subjects in an evening school are so many and so difficult that it is small wonder that the work is unsatisfactory to the teacher, the pupil, the principal of the school or the chance visitor.

A physics class visited had 49 pupils present on the night the work was inspected, one-third of whom were less than 16 years of age. Fourteen of the class stated that they were clerks, eight were machinists' apprentices, or helpers, eight were electricians' helpers and apprentices and the remaining 19 represented eight different occupations. The instructor was using a regular high



CLASS IN TRADE EMBROIDERY--NEW YORK EVENING HIGH SCHOOL FOR WOMEN

school text book in physics and was drilling the class in the meaning of amperes, volts and ohms. Half of the class attended less than 15 nights.

A chemistry class that had ten on register, out of a total enrollment of 37 pupils, had two machinists, two dye workers, two clerks, a newsdealer, a house man, a clothing salesman and a pencil maker remaining in the class. The pupils were doing individual work.

As a whole the teachers in trade mathematics were more successful in attacking the problems than were the other teachers of industrial science. Most of them had sets of problems ranging from very simple to quite difficult, a set for each of the trades represented in the class and each pupil who was a trade worker was provided with problems related to his occupation. The great difficulty there as in all the classes in industrial science was the large number of pupils in the class who were going to be trade workers and who should have been in an arithmetic class in an evening elementary school.

BUILDING AND EQUIPMENT

Harlem Evening Trade School: The Harlem Evening Trade School, located in the Boys' Vocational School, uses for the evening trade classes the equipment provided for the day vocational classes. This building and equipment are described in the report of the day vocational schools.

Murray Hill Evening Trade School: This school is located in the Murray Hill Vocational School. As pointed out in the day vocational school report, this building is the poorest used for vocational work in the city of New York. The building and equipment used for day classes in vocational work is described in the day school report. Besides the equipment used by the day classes, the principal of this school has been able to secure from manufacturers, employers' association and unions the equipment necessary to offer courses in baking, player piano mechanics, motion picture mechanics, offset press work and lithography. The equipment loaned and donated to this school by the manufacturers, employers' associations and unions is valued at about \$16,000. The equipment provided by the Board of Education is valued at approximately \$4,000. The building is so poor that it

was necessary to place the most expensive machine in the school, an offset press worth several thousand dollars, in a corner of a low, poorly lighted and poorly ventilated basement room. This one machine is worth more than the entire equipment provided by the Board of Education for both the day and evening vocational work in this school. In most of the evening trade schools, some trade classes have been organized without adequate equipment to carry on the work. This is illustrated in the organization of a class in commercial photography in this school. The instructor paid for the advertisements in the "Want Column" of a daily newspaper; purchased the necessary material for a dark room; provided the camera, plate holders and chemicals. Nearly forty photographers registered for this course, but the equipment was so meagre that many gave up the work after a few evenings.

The co-operation of the employers and employees in providing equipment for this evening school is due largely to the efforts of the principal, who has been able, in spite of the physical handicaps, to develop one of the largest and most successful evening trade schools in the City of New York.

Long Island City High and Trade School: This evening school is located in Bryant High School. The day school equipment for machine shop work, woodworking and drafting is used for the trade extension work. Two additional shops have been provided in the basement, one for lead work for plumbers and the other for a class in automobile repairing.

Stuyvesant Evening Trade School: The equipment used for both day and evening courses, such as machine shop work, forging, pattern making, carpentry and joinery, is ample, but the equipment provided for evening courses that are not offered in the day school is not sufficient to do work of a practical nature. This was particularly true in the elementary classes in electric wiring where the equipment consisted of a few boards that were laid on the tops of the desks or placed against the walls, and bells, batteries, wire and the necessary hand tools. The class in commercial photography had practically no equipment with which to work.

Bushwick Evening Trade School: The regular high school

equipment for the courses in machine shop work, pattern making, forging, woodworking, is used for the evening trade classes in these subjects. Additional shops have been equipped in the basement for classes in electric wiring, plumbing, sheet metal work and automobile mechanics. The equipment for sheet metal work is limited, consisting of a few sets of hand tools. The equipment provided for the work in automobile mechanics was limited to two engines and a few special tools.

Brooklyn Evening Trade School: The regular day school manual training equipment is used in this school for all courses except those in electric wiring and linotype operating. The equipment provided for electrical classes consisted of bells, wire, hand tools and one or two motors.

Tottenville Evening Trade School: The rooms and equipment provided for the courses in plumbing, terra cotta modeling, and gas engine mechanics are located in the basement and are used only for evening trade school work. Most of the equipment has been donated to the school by manufacturers, and is limited in quantity and variety.

Manhattan Evening Trade School: The building and equipment provided for this school is described in the day school report.

Evening School of Industrial Arts: The work of the Evening School of Industrial Arts is seriously handicapped by lack of equipment and suitable quarters. The work is carried on in an elementary school building and most of the classes are conducted in the regular class room. A special room has been fitted up for the class in jewelry design, and a play room in the attic is used for the class in mural decoration. One class in costume design was conducted in the domestic science room. It is difficult for adults to sit at elementary desks and do satisfactory work in design.

DISTRIBUTION OF STUDENTS BY SUBJECTS

The following chart shows the number of classes, the total register and the number of pupils on register March 28, 1917,

in the nine evening trade schools distributed by trade groups and trades:

CHART 11.

	Number Classes	Total Reg- ister to March 28, 1917.	Number on Register March 28, 1917.
<i>Drawing and Design:</i>			
Architectural Drawing	7	246	137
Blue Print Reading	1	121	29
Commercial Design	1	41	20
Free-hand Drawing	2	74	37
Garment Design	4	235	125
Industrial Design	1	34	25
Ladies Garment Design	6	325	133
Mechanical Drawing	20	1070	472
Plan Reading	7	263	142
Ship Drafting	1	31	21
Structural Steel Drafting....	1	41	18
Terra Cotta Design	1	27	22
Trade Drafting	2	64	49
	54	2572	1230
<i>Dressmaking and Millinery:</i>			
Dressmaking	3	96	74
Millinery	1	28	25
	4	124	99
<i>Electrical Work:</i>			
Applied Electricity	5	171	71
Electrical Engineering	2	65	31
	7	236	102
Electrical Wiring and Installation	25	1000	570
Municipal Electric Theory	2	50	31
	34	1286	703
<i>Gas Engine:</i>			
Gas Engine Mechanics and Auto Repair	14	686	382

	Number Classes	Total Reg- ister to March 28, 1917	Number on Register March 28, 1917
<i>Special Trades :</i>			
<i>Industrial Science :</i>			
Chemistry	6	193	101
Physics	3	175	75
Shop Arithmetic	2	74	29
Trade Mathematics	1	51	25
	—	—	—
	12	493	230
<i>Lithography :</i>			
Offset Press Work.....	2	60	36
Litho-Photography	2	55	41
Litho-Transfer	1	22	13
	—	—	—
	5	137	90
<i>Metal Trades :</i>			
Machine Shop	21	986	567
Blacksmithing—Forging			
Tool Making	6	263	127
Sheet Metal	4	153	86
	—	—	—
	31	1402	780
<i>Plumbing :</i>	15	614	302
<i>Printing Trades :</i>			
Kelly Press Operating.....	2	76	38
Linotype Operating	4	122	87
Monotype Operating	2	42	31
Printing	8	369	180
Proofreading	3	83	55
	—	—	—
	19	692	391
Baking	2	42	27
Commercial Photography	3	84	44
Interior Decoration	1	21	12
Motion Picture Mechanics.....	2	62	32
Player Piano Mechanics.....	1	35	15
Sign Painting	2	52	23
Steam Engineering	2	80	20
Surveying	1	24	13
Terra Cotta Modeling.....	1	20	20
Wireless	1	17	17
	—	—	—
	16	437	223

	Number Classes	Total Reg- ister to March 28, 1917	Number on Register March 28, 1917
<i>Special Trades:</i>			
<i>Woodworking Trades:</i>			
Cabinet Making	5	163	98
Carpentry and Joinery.....	8	221	150
Pattern Making	3	117	64
	18	501	312
<i>Evening School of Industrial Arts:</i>			
Book Illustration	4	142	72
Costume Design	4	187	115
Jewelry Design	1	23	11
Mural Decoration	2	72	44
Plastic Design	1	22	16
Poster Design.....	1	89	22
Stained Glass Design	1	14	8
Textile Design	1	22	13
	15	571	301
(1) <i>Manhattan Evening Trade School</i>			
<i>for Girls:</i>			
Drafting and Pattern Outting.	2	150	45
Waist Draping	2	92	47
Garment Operating	4	348	80
Straw Machine Operating	2	91	39
Embroidery Operating	2	79	36
Lamp Shades and			
Novelty Work	1	27	20
	13	787	277
(1) Short courses ranging from 5 to 30 nights.			

SUMMARY:

1. The evening trade classes represent the largest field of industrial education in New York City, both in numbers enrolled and in variety of trades represented.
2. The supervision of the evening trade classes is left almost entirely in the hands of the principals of the schools. This lack of centralized control is shown in the content of the courses of study; the different kinds of instruction offered in classes having the same titles; the requirements for admission of pupils to trade classes; and the teaching methods employed.
3. Very little attempt has been made to secure the co-operation of employers' associations and unions in developing the evening trade classes. Such co-operation as has been secured has been the work of individual principals and

has been of little value in developing the evening trade classes as a whole.

4. Very few classes have been organized to meet the needs of special groups of workers. Not one class made up entirely of apprentices was found in the evening trade classes. In many classes men representing five or six trades were found in the same class.
5. The principal, and in many cases the individual teacher, advertises the evening trade classes. No broad, comprehensive campaign has been developed for advertising the evening trade classes.

REPORT OF ADVISORY COMMITTEE OF EVENING TRADE SCHOOLS

Resting upon the findings of fact developed by the present survey, the committee feel that evening trade schools consisting of trade extension classes whose members are employed during the day in occupations to which the instruction offered is strictly related, represent the most important need for industrial education presented in the city and that provision for such schools should be made on a corresponding scale.

The survey shows that evening classes are needed for the following reasons:

(a) In order to provide opportunity for better all-round training for the worker. Such opportunity is lacking in the proper training of apprentices in most manufacturing establishments where the work is usually of a more or less highly specialized character.

(b) The rank and file of industrial workers leave school at so early an age that development of initiative and ability is apt to be very slow, if not lost entirely. The evening trade extension class offers opportunity to the individual to find himself.

(c) The demand is so great at the present for skilled workmen, gang bosses and foremen, that it is extremely essential that properly organized trade extension classes give the opportunity and help to men in the trades in preparing themselves for the better positions or places in industry which are waiting for them.

(d) Industries are changing in character and it is frequently necessary for the worker to obtain instruction along other than his accustomed lines of work in order that he may keep abreast with modern industrial development, methods and processes. Trade extension classes operating on the unit course plan may be of invaluable aid to such men.

Inasmuch as the state law requires that pupils in evening trade or homemaking classes, receiving state aid shall be 16 years

of age or over, and inasmuch as employers, as a rule, will not accept boys under 16 as apprentices, the committee are of the opinion that 16 years should be, as at present, the minimum age of pupils admitted to evening trade extension classes.

A study of the survey report shows that large numbers of pupils are admitted to evening trade extension classes who are not employed in industrial or trade pursuits during the day. The committee recommends that applicants for admission to trade extension classes should not be accepted as members of the class unless employed during the day in an occupation recognized as a part of the trade in which instruction is offered.

The survey shows that one of the serious weaknesses in carrying forward evening trade classes is the large falling off in attendance mainly brought about by the tendency of many persons to register and drop out after a few nights in the class. In order to insure seriousness of purpose in those registering for these classes, the committee recommends that a nominal deposit be required in each course of all pupils registering in evening trade extension classes, this deposit to be returned to those students maintaining an average attendance of at least 75 per cent. of their class sessions. This fee should be large enough to cover the cost of any texts, materials, and supplies lent the pupil in order that he may feel the responsibility of the return to the school, when it is necessary for him to do so, of all such material in satisfactory condition.

In regard to organization, the committee recommend that all evening trade schools should be under the final authority of the person having in charge the direction of all-day vocational or trade schools. Many of the problems of the evening trade schools are similar to those of the all-day schools giving intensive instruction in trade work:

Men of practical experience teaching in the day schools are available for work in evening schools.

Investigations or surveys should be made to determine the need of certain kinds or phases of trade instruction by the head of the entire system.

The equipment in said schools should be made available for evening trade school purposes.

The organization of classes, in the judgment of the committee, should follow the present plan which offers two nights per week

for a definite number of weeks in any course of instruction in any specific trade subject, but not exceeding thirty weeks a year for any special unit. Students, however, with the consent of the director of industrial education, should be given the opportunity to attend a second class in a related trade subject.

In regard to the size of classes, the committee are of the opinion that shop classes should not exceed 16 and that classes in trade drawing, shop mathematics and trade science should not exceed 20 to 24. Men and boys in trade classes differ extremely as far as ability, trade experience and previous school training are concerned. Instruction of necessity must be largely individual. With the class in session barely two hours, the teacher can spend less than ten minutes with the individual if the number exceeds twelve in the class. To those having experience in evening classes it is obvious that the personal contact between teacher and pupil give the most satisfactory result. When students are enrolled it is highly desirable that teachers should register students for their own classes. The personal interview, which cannot be satisfactorily accomplished by the principal alone, helps very much in ascertaining the needs of the applicant and in placing or classifying him with the group where he belongs.

This committee heartily endorses the recommendations of the committees appointed by the Allied Printing Trades Council and the Association of Employing Printers, for the establishment of a central school of printing and also the adoption of the courses of study suggested by these committees for evening trade extension classes in printing.

This committee also has the firm conviction that it is advisable to bring together in one school wherever practicable all evening classes in the same field of work in order that through this larger grouping, students may be more readily and carefully graded as to their previous training, experience and ability. This plan will tend to improve the character of instruction and make possible much better and more far reaching results than are at present obtainable. This arrangement also makes possible a larger and more satisfactory equipment than can be had under the present plan of widely distributed classes in the same subjects.

The committee are of the opinion that a judiciously planned system of advertising will enable the evening trade classes to more

effectively reach the workers most prepared to benefit through such instruction. All advertising of evening trade extension classes should be controlled by a central source of publicity which should always in its advertising emphasize courses offered and opportunities available for the worker, rather than to accelerate the numbers in attendance therein. General publicity may be given through newspaper and bulletin board advertising but a special appeal stating opportunities offered to workers in each trade, should be made by means of circulars advertising courses of interest to each group. These circulars to be distributed to labor unions, employers and other interested parties. Lantern slides showing school activities can be shown in moving picture houses together with announcements of opportunities offered. Display advertisements in the "Want" columns of newspapers are very effective in calling attention to the school.

A study of the survey report indicates very clearly the lack of adequate supervision of these classes. The immense amount of routine clerical reports and work connected with them gives the principal of the school little opportunity to supervise properly the classes in his charge. The committee recommends that sufficient clerical help be provided to take care of all routine work and records in order that the principals may devote practically their whole time to visiting classes in their charge and that the teachers may devote their whole time to instruction.

The survey indicates the need of special supervisors for the work of many classes. For instance, there are 1,286 students enrolled in 34 classes in electrical work. No attempt has been made to standardize or even outline logical and systematic courses of instruction for all of these classes. This is practically true of all the other courses in the trade classes. This committee wishes to emphasize this lack of proper supervision and recommends that special supervisors be appointed to look after all classes in the special subjects under consideration by the survey committee. The duties of these supervisors may be outlined somewhat as follows:

(a) To determine from consultation with employers and employees the special needs that the instruction offered shall meet.

(b) To meet with and instruct teachers as to the needs of pupils, methods of teaching and assist in the working out of details of courses.

(c) To supervise carefully and check up the work of individual teachers.

(d) To make recommendations as to needed equipment and supplies.

(e) To determine the type of pupils who may enter various trade classes.

(f) To arouse interest in evening school work among labor unions and employers associations.

(g) To standardize courses of instruction and assist the board of examiners in the selection of teachers for classes under this supervision.

The committee recommends that a careful study be made of the various reports of the survey committee and from the information there given concerning the details of the different occupations investigated, courses of instruction be carefully outlined by a group of people thoroughly conversant with the needs of the workers and also competent to intelligently plan such courses. Such courses once thoroughly worked out can be readily followed by properly selected teachers, who, with the assistance of competent supervisors, can keep these courses of instruction in line, and abreast of, the demands of modern industry.

In regard to the short unit course referred to in the findings, the committee feel that it is very important that certain fundamental facts should be recognized:

(1) The short unit course of instruction in evening schools has its special value for adult workers who have not the habit or inclination to attend school courses of any length and who would be drawn to the evening school only to obtain assistance for some direct and particular need which arises in their immediate practical experience.

(2) For the young men between 16 and 21 years of age who attend evening courses, it is far better in the judgment of the committee to offer courses of a year, two years and even three years in length composed of matter that relates directly to trade needs and in which the instruction is differentiated to the fullest degree. It would be a great mistake in the judgment of the committee to emphasize solely to these young men in the developing period of life, and whose exact place in their industrial future is not yet defined, the idea of the short unit course, and place the educational emphasis only upon a brief fractional part of a single subject of instruction.

Signed

FRANK E. MATHEWSON,
C. R. DOOLEY,
O. B. FURNEY.

THE CO-OPERATIVE CLASSES IN THE NEW YORK CITY HIGH SCHOOLS.

The history of the movement for the establishment of co-operative classes in New York City is practically the same as that which resulted in the establishment of the continuation classes. The classes were started under the direct supervision of the late Dr. J. H. Haaren, associate superintendent of schools, with Dean Herman Schneider, of the University of Cincinnati, acting in an advisory capacity. The necessary authorization for the work was passed by the Board of Education September 16, 1914.

The following definition of the "Co-operative System" is taken from Dean Schneider's report (1911) to the Committee on School Inquiry of the Board of Estimate and Apportionment:

The Co-operative System: "The co-operative system is based on an agreement between a group of manufacturers and a school system whereby the manufacturers agreed to institute and carry on a thorough and comprehensive apprentice course in their particular trades; and in which the school agrees to give both general and specialized instruction to the apprentices. The course of work which the student receives in the shop is scheduled by the shop and must be approved by the school authorities. In most cases the amount of school instruction is equal to the amount of shop work. The apprentices are usually divided in two sections, that alternate with each other, for example, by weeks, so that when one section is at the shop and the other is at the school, both the shop and school, therefore, are always fully manned. The apprentices are paid for their work in the shop on the regular apprenticeship scale of their own particular trade.

The Co-ordinator: "In order that the work of the school may be definitely co-ordinated with the work of the shop, a separate set of teachers is sometimes employed. These may be called co-ordinators. A shop co-ordinator is a teacher well versed in shop practice. His function is to make a direct co-ordination of the work of the shop with the instruction of the schools."

The Co-operation of the High School Principals: The President of the Board of Education sent to the high school principals of the city a letter describing the proposed plan of co-opera-

tion between the schools and the employers, and, at a meeting of the principals, Dr. Schneider outlined the plan of co-operative work. Each of the principals who expressed an interest was visited by the associate superintendent in charge of the co-operating work and if he expressed a readiness to try the experiment in his school he was asked to name a member of his corps of teachers to act as co-ordinator.

Before the plan could be started it was necessary to secure the co-operation of the parents. This was done in many ways. Public meetings were held where the superintendent in charge of this work, the principal of the school, or the co-ordinator explained the plan to the parents who were present. The following statements are extracts taken from circulars describing the co-operative plan which were sent to parents:

"Co-operation is established only with such business houses as provide thorough training under favorable conditions in occupations leading to a competence, self-respect and development. In short, this plan means not getting a job but starting on a career.

"Full school credit will probably be given for the work done in the shop, store and office, so that the student under the co-operative plan may complete his course in the usual time.

"All boys and girls over the age of sixteen who have successfully passed in at least one year's work in any of the established high school courses and who obtain the consent of their parents, or guardians, to take this course, are eligible."

The Co-operation of Employers: In other cities where the co-operative plan has been introduced it has been at the request of the employers either as individuals or through their associations. Here the employers needed to be educated to appreciate the value of the plan to them as well as to the students. Much of this work had to be done by the co-ordinators who made individual visits to offices of many firms in an endeavor to interest them in the plan. The following statements are extracts taken from circulars, describing the co-operative plan sent to employing firms. They are presented here because they furnish a standard by which the work of the classes can be judged:

"The work of the students in the industry follows a predetermined sequence (the office as shop syllabus) in order that the students may become familiar with the relations of the various processes to each other, as well as with the processes themselves.

"The work in the school is related to the work in the industry by the co-ordinators (employed by the Board of Education) who study the pupils and their work for the purposes of: (a) Discovering defects in the work and habits of students that may be corrected in school; (b) Finding how the school work may supplement the industrial work."

Beginning the Work: As soon as schools, pupils, parents and employers began to be interested in the co-operative plan and expressed a willingness to undertake it, the work was started. Five schools (Curtis, Bushwick, Manual Training, Newtown, and Julia Richman) began work February 1, 1915. The Bryant started a week later. Stuyvesant began the work on February 22, the Commercial on March 8, and the Washington Irving on March 22. The Erasmus Hall School started on May 10. The table below gives the number of pairs of workers and the number of co-operating firms on the opening date for each school:

TABLE SHOWING SCHOOLS, DATE OF ORGANIZATION OF WORK, NUMBER OF PUPILS, AND FIRMS CO-OPERATING.

School	Date Beginning	Pairs Co-operating	Firms
		Pupils	Co-operating
Curtis	Feb. 1, 1915	6	3
Bushwick Com.....	Feb. 1, 1915	5	1
Bushwick Tech.....	Feb. 1, 1915	8	3
Manual Training.....	Feb. 1, 1915	10	3
Newtown.....	Feb. 1, 1915	12	3
Julia Richman.....	Feb. 1, 1915	1	1
Bryant	Feb. 8, 1915	1	1
Stuyvesant	Feb. 22, 1915	4	1
Commercial	Mar. 8, 1915	1	1
Washington Irving.....	Mar. 22, 1915	7	2
Erasmus Hall.....	May 10, 1915	2	2

During the half year, from February 1, 1915, to July 31, 1915, there were 63 different firms that co-operated in this work, employing a total of 103 boys in 19 different occupations and 65 girls in six occupations. Of the 103 boys, 42 were employed in machine shop work and 22 in clerical work; the remaining 39 were distributed in 17 different occupations. Of the girls, 31 were engaged in clerical work, 15 in salesmanship, 15 in dress-making, two in art work and two in corset making.

Development of the Co-operative Classes: The report for the week ending January 20, 1917, showed that the eleven high schools engaged in the co-operative work had 386 pupils in these classes and had been able to secure the co-operation of 90 firms. The distribution of these pupils by schools, the number of firms and the nature of the occupation of the pupils is shown in the table below:

School	Number of Pupils		Number of Firms	Nature of Work.
	Boys	Girls		
Bushwick — Industrial.....	37	..	12	Industrial
Bushwick — Commercial....	..	105	15	Clerical
Bryant	9	..	4	Industrial
Commercial	67	..	6	Clerical
Curtis	7	..	4	Industrial
Julia Richman.....	..	8	3	Clerical
Morris	3	27	5	Clerical and Salesmanship
Manual Training.....	42	..	12	Industrial
Stuyvesant	8	..	7	Industrial
Newtown.....	21	28	15	Clerical and Salesmanship
Washington Irving.....	..	24	7	Industrial
	194	192	90	

Re-organization of Co-operative Work: In February, 1917, four weeks before this survey of the co-operative classes was started, the Committee on Industrial Schools and Vocational Activities of the Board of Education, secured the services of Dean Schneider for a week's time, to advise with those in charge of the co-operative classes concerning the re-organization of the work. The purpose of this re-organization was to take advantage of the experience gained in the two years that the co-operative classes had been in operation to reduce the expense and make the work more efficient by centralizing various types of classes in certain schools adapted by location and equipment for that work. As a result the classes were distributed as follows:

Manual Training High School—industrial work for boys,
 Washington Irving High School—industrial work for girls,
 Bushwick High School—commercial work for girls,
 Commercial High School—commercial work for boys,
 Morris High School—commercial work for boys and girls,

Newtown High School—commercial and mercantile work for boys and girls,

Julia Richman High School—commercial work for girls.

The direction of the co-operative classes was placed in the hands of the associate superintendent in charge of vocational activities who was already in charge of the prevocational schools, the day vocational schools and the part-time industrial and continuation classes.

Distribution of Pupils in Co-operative Work: For the week ending March 24, 1917, in the seven high schools, 474 different pupils were engaged in co-operative work for 122 firms. In order that the reader may see the nature and difficulty of the problem with which the co-ordinators were contending, tables are given for each school which show the names of the firms co-operating, the number of students, the nature of the work the pupil worker does, and the aggregate weekly wages earned.

STATEMENT SHOWING HIGH SCHOOLS HAVING CO-OPERATIVE COURSES, NUMBERS ENROLLED, THE NAMES OF FIRMS CO-OPERATING, THE NATURE OF THE WORK AND AGGREGATE WEEKLY EARNINGS—WEEK ENDING MARCH 24, 1917

BUSHWICK HIGH SCHOOL

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
American Book Company.....	..	6	6	Office Work
Bell Tailors.....	..	4	4	Office Work
Flemish Linn Phonograph Co.....	..	2	2	Steno. & Type.
Independent Magazine.....	..	..	..	Office Work
H. H. Ingersoll & Bro.....	..	22	22	Office Work
Liggitts	..	2	2	Clerical
Merchants' Association.....	..	2	2	Steno. & Type.
Montgomery, Ward & Co.....	..	33	33	Clerical
Oppenheim & Collins Co.....	..	4	4	Clerical
Portland Consolidated Copper Co..	..	1	1	Steno. & Type.
Remington Typewriter Co.....	..	4	4	Clerical
Review of Reviews.....	..	17	17	Clerical
Triangle Electric Trading Co.....	..	1	1	Steno. & Type.
Western Union Telegraph Co.....	..	1	1	Clerical
..		100	100	

Aggregate weekly earnings for half of the pupils—\$279.29.

COMMERCIAL HIGH SCHOOL

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
Broome & Newman.....	1	..	1	Clerical
Corn Products Refining Co.....	2	..	2	Clerical
Frugons-Balleto & Bellegatti.....	1	..	1	Collecting Accts.
Johnson & Higgins.....	2	..	2	Office Work
Remington Typewriter Co.....	18	..	18	Clerical
William R. Grace & Co.....	13	..	13	Clerical
Federal Reserve Bank.....	5	..	5	Mercantile
Public Bank of New York.....	2	..	2	Banking
The Texas Company.....	4	..	4	Banking
	8	..	8	Office Work
	56	..	56	

Aggregate weekly earnings for half of the pupils—\$241.89.

JULIA RICHMAN HIGH SCHOOL

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
Colliers	2	..	2	Clerical
Funk & Wagnalls.....	8	..	8	Clerical
Lord & Taylor.....	8	..	8	Clerical
R. H. Macy & Co.....	4	..	4	Office Work
Western Union Telegraph Co.....	1	..	1	Clerical
	23	..	23	

Average aggregate weekly earnings for half of the pupils—\$61.00.

MORRIS HIGH SCHOOL

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
B. Altman & Co.....	1	..	1	Clerical
Lord & Taylor.....	8	..	8	Salesmanship
R. H. Macy & Co.....	16	..	16	Cler. & Sales.
R. H. Macy & Co.....	2	..	2	Mercantile
McClure's Magazine.....	2	..	2	Clerical
Peierls, Buhler Co.....	2	..	2	Clerical
	4	27	31	

Aggregate weekly earnings for half of the pupils—\$71.50.

MANUAL TRAINING HIGH SCHOOL

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
American Ever Ready Co.....	2	..	2	Drafting
B. Altman & Co.....	2	..	2	Power Plant
American International Co.....	4	..	4	Clerical
Amer. Machine & Foundry Co.....	5	..	5	Machine Shop
Beckers Aniline & Chem. Works..	4	..	4	Chemical Work
E. W. Bliss & Co.....	1	..	1	Machine Shop
Brady-Murray Motor Corp.....	2	..	2	Auto Repairs
Doehler Die Casting Co.....	4	..	4	Die Casting
Electric Bond & Share Co.....	2	..	2	Clerical
Robert Gair Co.....	7	..	7	Printing
J. B. Hoecker & Co.....	1	..	1	Lens Grinding
Intertype Corporation.....	1	..	1	Machine Shop
Isaac Blanchard Press.....	3	..	3	Printing
Lehn & Fink.....	2	..	2	Mercantile
R. H. Macy & Co.....	1	..	1	Power Plant
Mergenthaler Linotype Co.....	17	..	17	Machine Shop
Metropolitan Engineering Co.....	4	..	4	Manufacturing
Richmond Light & R. R. Co.....	1	..	1	Power Plant
Richmond Light & R. R. Co.....	2	..	2	Power Plant
Sears Cross & Co.....	2	..	2	Machine Shop
Western Union Telegraph Co.....	10	..	10	Telegraphing
	77	..	77	

Aggregate weekly earnings for half of the pupils—\$233.33.

NEWTOWN HIGH SCHOOL

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
Abraham & Strauss.....	..	4	4	Clerical
B. Altman & Co.....	..	3	3	Clerical
Amoskeag	4	..	4	Office Work
Isaac Blanchard Press.....	1	..	1	Printing
Boy Scouts of America.....	5	..	5	Office Work
Cammeyer Shoe Co.....	..	1	1	Salesmanship
Ever Ready Co.....	4	..	4	Clerical
Funk & Wagnalls.....	..	3	3	Clerical
Lord & Taylor.....	..	5	5	Salesmanship
R. H. Macy & Co.....	3	14	17	Salesmanship
McClure's	..	4	4	Office Work
New York Times.....	1	..	1	Office Work
Peierls Buhler Co.....	2	2	4	Clerical
Rogers, Peet Co.....	1	..	1	Salesmanship
Slater Shoe Co.....	2	..	2	Salesmanship
U. S. Silver Fox.....	..	2	2	Clerical
Western Union Telegraph Co.....	1	..	1	Clerical
A. Winheimer	2	..	2	Clerical
Dommerich	1	..	1	Office Work
	27	38	65	

Aggregate weekly earnings for half of the pupils—\$222.85.

WASHINGTON IRVING HIGH SCHOOL

(Co-operating with Industrial Firms)

Name of Firm	Number of Students		Total	Nature of Work
	Boys	Girls		
Miss Smith.....	4		4	Industrial
Miss Finch.....	2		2	Industrial
Quality Shop.....	2		2	Industrial
Mood Co.....	8		8	Industrial
Vice	4		4	Industrial
B. Gordon.....	2		2	Industrial
Alperstein & Wittenberg.....	4		4	Industrial
O'Donovan	4		4	Industrial
Miss S. Finkelstein..	2		2	Industrial
Rohn & Rienzi.....	14		14	Industrial
G. A. Simpson.....	8		8	Industrial
P. F. McGowen Co.....	4		4	Industrial
Helen Sheppard.....	4		4	Industrial
	62		62	

Aggregate weekly earnings for half of the pupils—\$174.00.

(Co-operating with City Departments)*

Name of Dept.	Number of Students		Total	Nature of Work
	Boys	Girls		
Dr. Robinson, City College.....	2		2	Clerical
Secretary, Board of Education.....	6		6	Clerical
Director of Janitors, Mr. Maguire....	2		2	Clerical
Associate Supt. Dr. McAndrew.....	2		2	Clerical
Associate Supt. Dr. Shallow.....	2		2	Clerical
Associate Supt. Dr. Ettinger.....	2		2	Clerical
Bureau of Statistics.....	2		2	Clerical
District Supt. Dr. Stitt.....	2		2	Clerical
Mr. Foster	2		2	Clerical
Miss Farrell	2		2	Clerical
Dr. Haney	2		2	Clerical
Mrs. Wilcox	2		2	Clerical
Mr. Jenkins	2		2	Clerical
Physical Training Department.....	2		2	Clerical
Miss Moscript	2		2	Clerical
Bureau of Attendance.....	6		6	Clerical
P. S. No. 40, Dr. Van Denburgh....	2		2	Clerical
Bureau of Recreation.....	4		4	Clerical
Mr. Mills	4		4	Clerical
Mr. Dobbins.....	4		4	Clerical
Employment Dept., Wash. Irv. H. S. .	2		2	Clerical
Co-ordinator's Office, Wash. Irv. H. S. .	2		2	Clerical
Dr. Byrnes	2		2	Clerical
Pupils worked without pay	60		60	

* Up to February, 1917, no co-operative pupils who were not being paid for the time they spent out of the school were reported. Beginning March 12, it was decided to count the pupils in the commercial department of Washington Irving High School who were working for city departments and received no pay as co-operative students.

SUMMARY FOR THE WEEK

Total aggregate earnings for half of the pupils.....	\$1,283.86
Total number of pupils co-operating.....	474
Total number of firms co-operating.....	122
Total number of high schools co-operating.....	7

Limits of the Survey: This survey was limited to those schools (Manual Training, Morris, Newtown and Washington Irving) that were training pupils for the industries and salesmanship which represented about one-third of the co-operative work organized at the time of the survey. The trades at which the pupils were working and the number of pupils from each of these four high schools who were preparing for each trade is shown in the table on this page. As indicated in the table on page 167, three other high schools (Bushwick, Julia Richman and Commercial) were working under the co-operative plan, but as they were training exclusively for commercial work and not for industrial work or salesmanship, they are not considered in this part of the report.

STATEMENT SHOWING DISTRIBUTION OF PUPILS IN INDUSTRIAL
AND SALESMANSHIP CO-OPERATIVE CLASSES BY SCHOOLS
AND OCCUPATIONS ON MARCH 24, 1917.

	Manual Training		Morris		Newtown		Wash. Irving	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Automobile Repairing....	2	..	..	..	..	..	..	..
Chemical	4	..	..	..	..	..	..	..
Drafting	2	..	..	..	..	..	..	..
Dressmaking	..	..	..	..	..	..	..	62
Die Casting.....	4	..	..	..	..	..	..	..
Lens Grinding.....	1	..	..	..	..	..	..	..
Manufacturing	4	..	..	..	..	..	..	..
Machine Shop.....	26	..	..	..	..	..	..	..
Printing	10	..	..	..	1	..	..	..
Power Plant Operating... 6	..	..	..	..	..	..	..	..
Salesmanship	..	..	..	24	6	20	..	..
Totals	59	..	..	24	7	20	..	62

CO-OPERATIVE INDUSTRIAL COURSE FOR BOYS IN THE MANUAL TRAINING HIGH SCHOOL

Organization: After the re-organization of the co-operative classes in February, 1917, the industrial work for boys was discontinued in the Bushwick, Bryant, and Curtis High Schools and centralized in the Manual Training High School of Brooklyn. At the time of the survey in March, 1917, this school had an enrollment of 3500 boys, 59 of whom were enrolled in the industrial co-operative course. Practically all of the boys in this course were in separate classes for all subjects but because of the limited number of boys registered for any of the trades except machine shop practice, they were not grouped or divided according to trades or occupations. The classes were taught by regular high school teachers, no one of whom spent all of his time in co-operative work.

Character of the Instruction: In almost all classes the instruction was found to be of a general industrial nature with as close correlation to the shop work of the boys as was possible where pupils working at several different trades were in the same class. The one class that was an exception to this was in chemistry which was taught as a pure science with little practical application or correlation with industry. In this particular case the need seemed to be apparent for more authority on the part of the co-ordinator so that he might bring about some adjustment in such cases as this. In English the classics (except "Henry VIII" and "Idylls of the King") had been dropped from the co-operative course. Much emphasis was placed on current events, conversational English, oral expression, spelling, and letter writing. In mathematics certain propositions were chosen that had a practical bearing on trade problems. A thorough drill was given in the use of the slide rule and logarithms. Applications of rules and formulae for belting, speeds and gearing were given in the course. In physics the emphasis was placed on mechanics, power machines, electricity, electrical testing, steam and gas engines. The course in history was made up of industrial history, American history, civics, economics and the biography of inventors.

The shop work was largely of the usual manual training type with only slight modifications to meet the needs of the pupils in the co-operative work. Since pupils studying several different trades were in the same shop class (for instance, pupils in printing were in the forge shop) the school shop work was correlated

with the factory work only in the case of those boys who happened to be employed in the same line of work outside.

Course of Study: The plan of studies for this school is given as an illustration of what has been done to adjust the regular high school course of study to the needs of the boys in the co-operative classes. In some cases students began work under the co-operative plan in the second year, in which case the number of points per term for the school subjects is one-half the number here given and 12 points are given for the work in industry as in the third year.

MANUAL TRAINING HIGH SCHOOL BROOKLYN

Plan of Studies	Industrial Co-operative Course	
	Hours per Week	Points per Term
First Year:		
English	5	5
Expression	1	1
Algebra	5	5
General Science.....	5	5
Drawing F. H. Mech. 2.....	4	2
Shopwork—Materials	7	3½
Music	1	½
Physical Training.....	2	1
	30	23
Second Year:	Hours per Week	Points per Term
English	3	3
Geometry	5	5
Chemistry	5	5
Industrial History.....	3	3
Drawing F. H. Mech. 2.....	4	2
Shopwork and Materials.....	7	3½
Music	1	½
Physical Training.....	2	1
	30	23
Third Year:	Hours per Week	Points per Term
English	5	2½
Mathematics	5	2½
Physics	5	2½
Commercial Law or Economics.....	4	2
Mechanical Drawing.....	5	1
Shop Work—		
Machine Shop.....	..	..
Materials	6	1½
	30	12
Time in Industry.....	48	12
		24 points

MANUAL TRAINING HIGH SCHOOL

Industrial Co-operation Course

Fourth Year:	Hours per Week	Points per Term
English	5	2½
Business Practice and Bookkeeping.....	4	2
Physics (Electricity).....	5	2½
American History and Civics.....	5	2½
Mechanical Drawing	5	1
Machine Shop	6	1½
	30	12
Time in Industry.....	48	12
		24 points
Points required for graduation.....		150 points

Records of Pupils: During February and March, 1915, there were 40 boys from this school who started on the co-operative plan of work. In February, 1917, they were distributed as follows:

Still working in the co-operative course.....	18
Transferred to other schools.....	3
Transferred to regular manual training course.....	3
At work.....	11
In military service.....	1
Unknown	4
Total	40

There were six boys who graduated from the co-operative course in June, 1917.

Attitude of Employers Toward Co-operative Pupils: The methods of measuring the outside work by the school authorities are chiefly through the reports given on the boys' work by the foremen and superintendents of the shops and the work of the co-ordinator who checks up these reports by personal visits to the boys at work. Each boy also makes a report the first day of his return to school.

All of the employers of the boys who were doing industrial co-operative work stated that they favored the plan of co-operation between the school and the industry, although there was a wide difference in their methods of handling the boys that worked for them. This may be shown by comparing two firms in the same line of business.

The first firm had about 250 employees, of whom 24 were boys,

two of them working on the co-operative plan. This firm desired to have the boys spend from six months to one year running errands for which they would receive \$6.00 a week, and then for another year they were to distribute leads and learn the case, receiving \$7.00 per week. One difficulty with the scheme was that none of the boys would stay to complete the errand boy period. The foremen stated there had been an aggregation of twelve boys sent to this firm, most of them staying only about three months. One stayed a year spending eight months as errand boy and four months on the monotype. The foreman said that the boys were a nuisance coming in one week and out the next, and, although he admitted that they were of a good grade, he complained that they expected to set type or run a press as soon as they started to work. The boys objected strenuously to the long errand period. With their own apprentices the firm was quite liberal. They sent the boys to the apprentice school, paying the fees and their wages for the time spent there.

The other firm when visited in April, 1917, had seven boys who were doing co-operative work and would have been glad to have had ten more. The firm had started this plan one and a half years before this and had had a total of twenty-two boys from the schools. Of this number, twelve divided their time between the firm and the school; four were with them as full time workers, and six had left, three to enter office work and three to go with other printing establishments. Although the foremen were opposed to the scheme at first, later they favored it heartily. The foreman of the press room said: "They are absolutely the best boys we ever had." He said furthermore that as soon as the apprentices in the shop had finished their apprenticeship the firm would put in co-operating boys exclusively. Plans had also been worked out so that the boys could go into the color department and the lithographing department. The schedule for these boys in the press room was three months as "fly boys" and helpers and nine months as press tenders and assistant feeders at \$7.00 per week. After one additional year as feeder a boy could go in as a pressman, working up as opportunity offered to the more skilled and better paid positions.* These employers expressed themselves as perfectly satisfied with the results of the co-operative

*The opportunities for advancement in the press room are shown in detail in the printing report.

scheme and showed a willingness to work more closely with the school authorities and to follow a more definite scheme.

A manufacturing concern which can be taken as a type of those employing boys in machine shop work, started to co-operate with the Manual Training High School in February, 1915. At the time of the survey they had 18 boys co-operating, four of whom had been with them for the two years. The co-ordinator and superintendent had worked out a regular shop schedule for the boys. The factory was divided into nine departments, each pair of boys working for three months in each department which gave each boy six weeks of actual shop work in each. These departments were: (1) Engineering and shop repair; (2) Brass foundry; (3) Tool room and machine repair; (4) Brass working; (5) Pattern making, both wood and metal; (6) Nickel plating; (7) Blacksmithing; (8) Light manufacturing; (9) Tool making. The co-ordinator was given entire power to change the boys to other departments. The wages paid were \$5.00 per week at the beginning, after which they were paid what the foreman thought they were worth. This firm had 40 apprentices in the tool room. Their schedule of pay was the same as the co-operative boys. The assistant superintendent of the factory kept an exact record of the progress of the co-operative boys, being much interested in this experiment. All the boys interviewed stated positively that they would not have been in school at this time if it had not been for the co-operative plan. All expressed themselves as being pleased with the opportunity of going to school and at the same time doing practical work and earning money.

At the beginning of the experiment the superintendent and foreman were very much in favor of the plan, but at the time of the survey the foreman was not so strongly in favor of it. They felt that the boys did not stay long enough in one department, each boy being in one department only six weeks of actual working time.

It is impossible to give a detailed account of all the factories co-operating, but it can readily be seen from the above instances that every firm presented its own peculiar problems.

At the time of the reorganization of the co-operative work in February the pupils from the Bushwick and Bryant High Schools who were co-operating with industrial firms were transferred to the Manual Training High School and combined with the co-operative classes there. The table on the page following shows the

firms that were co-operating with each school on January 20th before the consolidation of the two groups, with the number of pupils each firm employed and shows the results of the consolidation as far as the number of pupils and number of firms are concerned. The table also shows that practically all of the firms that were co-operating with the Manual Training High School in industrial work in February, 1917, were also co-operating in June and employing about the same number of boys. This is in marked contrast with the firms that were co-operating with the schools in dressmaking and in salesmanship:

TABLE SHOWING RESULT OF THE CONSOLIDATION OF THE BUSHWICK CO-OPERATIVE CLASSES WITH
THOSE OF THE MANUAL TRAINING HIGH SCHOOL.

Nature of Work	Bushwick Industrial, Jan. 20, 1917		Man. Tr. Industrial, Jan. 20, 1917		Manual Training High School After the Consolidation				
					Feb. 10, Mar. 19, Apr. 7, May 5, June 2, 1917 1917 1917 1917 1917				
					14	18	17	17	17
Mergenthaler Linotype Co.....	6	10							
E. W. Bliss & Co.....	11				1	1	1	1	1
American Machine & Foundry Co.....	1	5			6	6	6	6	6
American International Co.....	2				2	4	3	3	3
B. Altman & Co.....	2				2	2	2	2	2
Western Union Tel. Co.....	9	4			9	11	11	11	11
Lehn & Fink.....	2	2			2	2	4	4	4
Sears, Cross & Co.....	2				2	2	1	1	1
Intertype Corporation.....	2				2	2	1	1	1
Blanchard Press.....	3				3	3	2	2	2
Beckers Aniline & Chemical Works.....	6	2			5	4	4	3	3
R. H. Macy & Co.....	1	1			2	2	1	1	1
J. B. Hoecker & Co.....		2			2	1	1		
Robert Gair Co.....		9			9	7	7	7	7
Doehler Die Casting Co.....		3			4	4	4	4	4
Metropolitan Engineering Co.....		2			2	4	4	4	4
R. H. Coney.....		1			1				
Richmond Light & R. R. Co.....		1			1	1	1	2	2
American Ever Ready Co.....						2	2	2	1
Brady Murray Motor Corporation.....						2	2	2	1
Electric Bond & Share Co.....						2	3	4	4
W. Haedrick.....							1	1	1
Total number of pupils.....	37	42			69	80	78	75	74

CO-OPERATIVE INDUSTRIAL COURSE FOR GIRLS IN THE WASHINGTON IRVING HIGH SCHOOL.

Organizations: The organization of the school work for the co-operative girls has been in some respects less difficult than the organization of similar courses for boys. While the boys in co-operative courses in the Manual Training High School were engaged in many different occupations with only a small number of boys in any one occupation, practically all of the girls in the co-operative classes in the Washington Irving High School were employed in the one occupation of dressmaking, a trade for which the girls had had special preparation in school. This rendered it unnecessary to have a special teacher, or teachers, for the girls who were co-operating, although to a large extent the girls in this course were in separate classes. There were seventeen of these special classes and four classes where pupils in this course had been put with pupils doing regular work.

At the time of the re-organization of the co-operative classes in February, the Washington Irving School had 24 girls co-operating with seven firms. Four of these girls were employed in the manufacture of lamp shades and the others were engaged in dressmaking establishments.

The following table shows how difficult is the organization of co-operative classes in such a seasonal trade as dressmaking and how much of the time of the co-ordinator was spent in securing firms with whom to co-operate. It will be noted that three firms employed pupil-workers continuously from February 24, 1917, to June 2, 1917, each firm having a single pair of girls. Six firms furnished employment continuously from March 24 to June 2, employing eleven pairs of girls. Twenty pairs of girls were employed continuously for a month or less by the firm with which they were working.

Character of Work of Co-ordinator: The special needs of each position are investigated and by a study of the personality of the girl and her record in school, an effort is made to find the right kind of a girl for each position. Every care is taken to protect the girl; close supervision is made of her work and when undesirable conditions developed that can not be adjusted, she is withdrawn.

FIRMS AND NUMBER OF PUPILS CO-OPERATING WITH THE
WASHINGTON IRVING HIGH SCHOOL FROM
FEBRUARY TO JUNE, 1917:

Firm	Occupation	Feb	Mar.	Mar.	Apr.	Apr.	May	May	June
Grace Daggett.....	Lamp Shades..	24	10	24	7	21	5	19	2
Miss Finch.....	Dressmaking..	4	2	..	..	..	..	..	..
Barnard Studios.....	Dressmaking..	2	2	2	2	2	2	2	2
B. Gordon.....	Dressmaking..	4	..	..	..	..	..	..	..
B. Gordon.....	Dressmaking..	2	2	2	2	2	2	2	2
Harry Collins.....	Dressmaking..	4	..	..	..	..	..	..	..
Little Dress Co.....	Dressmaking..	..	4	..	..	..	..	..	..
Moe	Dressmaking..	..	4	4	4	..	..	..	..
Quality Shop.....	Dressmaking..	2	2	2	2	2	2	2	2
Miss Smith.....	Dressmaking..	4	4	4	4	4	..	..	..
Mood Co.....	Dressmaking..	..	..	8	16	8	12	14	14
Alperstein & Witten-									
berg	Dressmaking..	..	..	4	4	4	4	4	4
O'Donovan	Dressmaking..	..	..	4	4	4	..	..	..
Mss F. Finklestein..	Dressmaking..	..	..	2	2	2	2	2	2
Rohn & Rienzi.....	Dressmaking..	..	..	14	12	12	..	..	..
G. A. Simpson.....	Dressmaking..	..	..	8	8	8	..	..	..
P. F. McGowen.....	Dressmaking..	..	..	4	4	8	4	8	8
Helen Sheppard.....	Dressmaking..	..	..	4	4	4	..	..	..
M. St. Ledger									
Hackett.....	Dressmaking..	..	..	..	4	4	4	4	4
B. Altman.....	Dressmaking..	..	..	..	4	4	8	8	8
Anna McNalley.....	Dressmaking..	..	..	..	..	4	4	4	4
Kerkow, Inc.....	Dressmaking..	..	..	..	..	..	4	..	..
Mrs. Hilda Moburg..	Dressmaking..	..	..	..	..	..	1	1	1
R. H. Macy & Co...	Dressmaking..	..	..	..	..	..	2	2	2
Total pupils.....		22	20	62	76	72	51	53	53

The seasonal character of dressmaking with the constant change in materials and styles made it difficult to adjust the school program to the trade needs. The busy months are March, April, May, October, November, December. The Easter rush was just beginning to be felt in this school when the survey was made. One interesting feature of the work in this course was the vocational value of French in the dressmakers' shops. To meet this situation a special syllabus was worked out by the French teacher and approved by the Board of Education.

This school was no longer co-operating with firms in the white goods trade because the girls were kept too long in one type of work. Some dressmaking firms had decided preference for cer-

tain nationalities and decided objections to others. The Irish and French girls seemed to be the favorites. Some firms specified that the girls must be good looking and dress well.

Record of Pupils: From the time the co-operative work started on March 31, 1915, up to June 26, 1915, twenty girls entered this course. In February, 1917, they were distributed as follows:

Number of girls now employed.....	15
Number of girls at home.....	2
Number of girls in school.....	3
Total	20

The fifteen girls employed were working at the following occupations:

Dressmaking	7
Private dressmaking.....	1
Sketching	1
Clerical work.....	3
Salesmanship in dressmaking establishments.....	3
Total	15

CO-OPERATIVE SALESMANSHIP COURSE FOR BOYS AND GIRLS IN THE MORRIS AND NEWTOWN HIGH SCHOOLS.

Since the co-operative classes in salesmanship in these two high schools were under the same co-ordinator whose time was divided between the two, the salesmanship course will not be described separately for each school. Since February, 1917, all of the pupils co-operating in salesmanship have been in one of these two schools.

Course of Study: Considerable time has been devoted by the school authorities and representatives from some of the mercantile establishments of the city to the development of a course of study in salesmanship. This course as adopted by the schools is given below:

NEWTOWN HIGH SCHOOL**First Year****General Course.****Second Year****Students attend school full time.****Co-operative Course**

English	5
Commercial Arithmetic	5
Bookkeeping	5
Penmanship	2
Local Institutions and Industries	3
General Science	5
Drawing	2
Music	1
Physical Training	2
Elocution	1
	29

Third Year**Students spend one week in store and one week in school.**

English, letter writing, saleslips	5
Bookkeeping	5
Penmanship	2
Arithmetic	3
Merchandising—Textiles, non-textiles	5
Spelling	2
Drawing—Color and Design	2
Music	1
Physical Training (Store Hygiene)	2
Commercial Law	2
Elocution	2
	29

Fourth Year**Students spend one week in store and one week in school.**

English-Advertising	5
Industrial History	5
Salesmanship and Business Organization	5
Arithmetic	3
Spelling	2
Economics	3
Penmanship	2
Drawing—Color and Design	2
Physical Training (Personal Hygiene)	2
Elocution	1
	30

Results of Salesmanship Courses: The results accomplished in salesmanship have not been entirely satisfactory to either the school authorities or the firms with whom the schools have been co-operating. The table below shows what was accomplished during the half year from January to June, 1917. It will be noted that at the end of this period only three firms were co-operating with the schools in salesmanship and that of the 30 pupils so employed, 24 of them were with one firm:

**NUMBER OF FIRMS AND THE NUMBER OF PUPILS EMPLOYED BY
EACH FIRM IN SALESMANSHIP,
JANUARY TO JUNE, 1917:**

(1917)	Jan.	Feb.	Feb.	Mar.	Mar.	Apr.	Apr.	May	May	June
Newtown High:	20	10	24	10	24	7	21	5	19	2
Cammeyer Shoe Co.....	1	1	1	1	1	..	..	..	..	..
Rogers Peet & Co.....	1	1	1	1	1	1	1	..	..	..
Gimbel Bros.....	14	..	..	..	..	..	..	..	..	..
R. H. Macy & Co.....	3	16	14	17	17	14	9	10	10	11
Slater Shoe Co.....	2	2	2	2	2	2	2	2	2	2
Lord & Taylor.....	..	..	3	5	5	5	2	2	2	2
Abraham & Strauss....	..	..	4	..	..	..	..	..	..	..
B. Altman.....	..	..	3	..	..	..	..	..	..	..
Morris High:										
R. H. Macy & Co.....	18	..	14	16	16	16	16	12	..	13
Lord & Taylor.....	..	..	4	8	8	6	2	2	2	2
Gimbel Bros.....	6	..	..	..	..	..	..	..	..	..
	45	20	46	50	50	44	32	28	18	30

THE STUYVESANT HIGH SCHOOL.

It was felt that valuable information might be obtained from the study of the records of the co-operative classes in the Stuyvesant High School. There have been two distinct systems of co-operative work at this school: (1) Fourth-year boys co-operating in technical work, but receiving no pay for it. This work was started in September, 1914, and has continued up to the present time with a considerable degree of success. (2) Co-operation with industrial firms by students who did receive pay for their work. The latter plan began on February 1, 1915, and was discontinued under the re-organization of February 1, 1917.

This school at the time of the survey was co-operating with three private firms and four city departments. The boys received

no pay for their work and those in charge of the co-operative work at this school felt that it was successful largely because of this fact. They felt, too, that the no-pay plan gave the teachers an opportunity to insist that the boys should be shifted to other work when it was considered necessary for the good of the boy. The outside work of the boys, which in general was a practical laboratory course supplementing their regular class instruction consisted of assisting in architectural drawing, mechanical laboratories, surveying, power plant operating, structural engineering, and industrial chemistry.

Several reasons were given by those who had charge of the regular co-operative classes in the Stuyvesant High School for its lack of success. These were: (1) The difficulty of getting the boys to enter the co-operative course when they found out that it would not be accepted for college entrance; (2) The difficulty of arranging equal pairs; this caused objections from the foremen who were responsible for a certain output of product; (3) That when younger boys got good positions they left school; (4) The co-operative work caused the boys to have a divided allegiance between school and shop; (5) That many employers failed to see that the scheme was educational in intent and desired to use the boys as cheap help; (6) The difficulty in making orderly progress of classes by terms fits the needs of the outside shop work; (7) The difficulty in selecting the right pair of boys for the right job at the right time and adjusting school courses to supplement their outside work.

PERMANENCY OF THE INDUSTRIAL CO-OPERATIVE WORK.

It is too soon since the co-operative work was first started in New York City to determine its permanent character. The 1914-15 annual report of the part-time co-operative classes lists 27 firms that had co-operated with the schools in industrial work. At the time of the survey eight of these firms were employing boys on the co-operative plan. This same report lists eight firms co-operating with the high schools in dressmaking and five firms co-operating in salesmanship. Not one of these firms in either dressmaking or salesmanship was co-operating with the schools at the time of the survey.

The annual report for the year 1915-16 of the co-operative classes does not list the firms with whom the schools co-operated that year. However, through the courtesy of those in charge of

the co-operative classes, the semi-monthly reports of the co-ordinators for the period from January 8 to December 9, 1916, were secured and a list was made of the firms co-operating in industrial work and salesmanship. There were 40 industrial firms during the year which had one or more pairs of boys. Out of twenty-four firms that were co-operating in September, 1916, thirteen were co-operating at the time of the survey in March, 1917. Of the thirty-seven firms that employed girls from the co-operative classes between January 8, 1916, and December 9, 1916, for industrial work in dressmaking or the making of novelties or lamp shades, twelve firms co-operated for one month, nine for two months, six for three months, three for four months, five for five months, and two for over six months. On December 8, 1916, sixteen of these thirty-seven firms were employing girls from the co-operative classes.

The attitude of the pupils is also a factor that must affect the permanency of the work. Several of the co-ordinators stated that the difficulty of securing a sufficient number of pupils to enter the co-operative course was one of the greatest problems. The annual report of the co-operative classes for the year 1915-16 shows that 88 pupils left the course during the first term and 80 abandoned the course during the second term. Of the first group, one-half of the number or 44 entered employment and 38 of the second group entered employment, eight with the co-operating firms.

THE COST OF THE CO-OPERATIVE WORK.

The question of the cost of the co-operative work has had considerable discussion and the annual report for the year 1915-16 devotes several pages to this subject. Included in this statement of cost are the salaries of the co-ordinators and the proportional salaries of the teachers, the supervision and the text books and supplies that were given to the co-operative pupils. The per capita cost for each pupil, based on the average attendance for the term, ranged from \$36.03 at the Newtown high school with an average attendance of 75 pupils, to \$109.60 at the Erasmus Hall High School that had 12 pupils in average attendance. In the other schools it was also true that the cost was high where the average number of pupils was small. The centering of the work in seven high schools has lowered the cost so that it is probably no more than for the regular high school work, but the exact figures were not available when this report was written.

The following table prepared by the school authorities shows the cost of the co-operative work for the first term of the 1916-17 school year:

**COST OF CO-OPERATIVE EDUCATION FOR EACH HIGH SCHOOL
FOR THE TERM SEPTEMBER, 1916-FEBRUARY, 1917**

	Semi-annual salary of co- ordinator	Semi-annual salaries of teachers	Supervision and office	Supplies	Average No. of pupils	Per capita cost
Julia Richman.....(15/100)	\$199.00	\$294.00	\$15.00	\$30.00	10	\$53.80
Stuyvesant*(1/2)	787.00	532.11	12.35	5.00	19	70.63
Washington Irving...(1/2)	437.50	1720.00	25.00	37.60	50	44.40
Bushwick*(1/2)	787.50	2979.00	17.04	82.80	46	84.00
Bushwick(1/2)	587.50	2031.04	80.44	128.81	103	27.45
Commercial.....(All)	1325.00	1166.00	50.00	105.60	66	40.10
Manual Training....(45/100)	596.00	2470.00	35.25	35.25	47	67.23
Bryant*(30/100)	397.50	287.00	24.50	28.00	14	52.64
Newtown(1/2)	662.50	1395.00	30.00	38.50	60	35.43
Morris C.....(1/2)	662.50	1395.00	20.00	30.00	40	52.64
Curtis*(1/2)	600.00	669.51	27.85	20.00	12	09.78

Average per capita cost for the term, \$58.01.

*Work discontinued in February, 1917.

SUMMARY.

The findings of the survey of the industrial co-operative classes show the following:

1. That on March 24, 1917, there were 172 pupils enrolled in the industrial co-operative classes in four high schools. These pupils were distributed as follows:

Industrial Work (Boys).....	60
Dressmaking (Girls).....	62
Salesmanship (Boys and Girls)....	50

2. That the numbers enrolled in the industrial co-operative classes were so small and the occupations represented so diversified that the schools had not organized the school work so as to have it supplement the outside work of the pupil.

3. That 32 of the 40 firms co-operating in industrial work and salesmanship in 1914-1915 were not co-operating at the time of the survey in March, 1917.

4. That much of the time of the co-ordinator was spent in securing new firms to co-operate with the school and in persuading pupils to take this course.

5. That few of the pupils enrolled in the co-operative course in dressmaking have continuous employment for as long as three months with one firm.

RECOMMENDATIONS OF THE ADVISORY COMMITTEE ON CO-OPERATIVE INDUSTRIAL CLASSES.

After carefully weighing the information obtained by the survey committee, and after visiting the co-operative industrial classes now in operation in this city, your advisory committee is convinced that the city should maintain such co-operative classes with certain modifications as noted, at least for a period of several years to come when the question as to the value of such classes can be more fully determined.

Your committee makes this recommendation with a full realization that not many high school students can be counted upon to enter manual occupations in the industries. The ideals of the homes from which come the large body of high school students are directed distinctly away from such occupations for their sons and daughters and it is evident that the contribution of the high school to the field of industry must be found in supplying young men with well trained minds who are fitted after a further period of practical experience to attain to positions of at least subordinate leadership. Such positions have been termed the non-commissioned officers of industry and include draftsmen, inspectors, testers, designers and in general all positions of the supervising and foreman type.

From this analysis it is evident that the co-operative industrial classes in the high schools cannot be expected to teach large numbers and the critical question that ultimately must be faced is whether the return for such work is in proportion to its expense.

The industrial co-operative work should be organized as to trades and each trade should be centralized in one building or school. This centralization of the work is necessary to secure groups of sufficient size to allow the formation of classes of individuals with similar trade interests.

The committee believes that the most satisfactory division of

time for the co-operative industrial classes is half-time in shop and half-time in school as at present.

The co-operative industrial class should be in every sense on an apprenticeship basis. It should never be entered into unless there is a definite agreement with the employer specifying a program of shop experience with the hours of labor and wages. This agreement should be signed by the school authorities, the parent representing the boy and the employer. Without such an agreement it is impossible to serve adequately the needs of the state, the individual and the employer.

Co-operative industrial classes should be limited in so far as practicable to those industries in which at least thirty students are available for a closely related trade group that can be supervised effectively by one co-ordinator.

The co-ordinators should be selected on the basis of the requirements of the particular trade for which the co-operative industrial class is to train. That is, the co-ordinator for co-operative industrial classes in machine shop work should be a man with a thorough understanding of the machine trade. This same principle should be applied to the selection of all other co-ordinators. Each co-ordinator should be at the same time the teacher of related drawing, mathematics, and science for a double platoon group in the school and the supervisor of the work of the students of this group in the commercial establishments. Such a plan would permit both the interests of economy and efficiency to be realized.

The co-ordinator should have authority granted by the employer to see that the program to be followed by the boy in the shop is carried out.

The character of the instruction in drawing, mathematics and science should be such as to secure the greatest possible degree of relation to the trade or occupation in which the student is employed.

It must be kept constantly in mind that the co-operative industrial course is not a college preparatory course, but that it is a course, the predominant purpose of which is to train the student for advantageous entrance into a specific industry.

In addition to the related work instruction should be provided as far as practicable in those subjects which make for intellectual, social and civic development.

Inasmuch as the co-operative industrial classes have many

aspects in common with the part-time industrial classes, it is recommended that both types be placed in charge of a common assistant director responsible to the director of industrial education.

In the opinion of the advisory committee the entrance requirements for the industrial co-operative classes should be based upon age rather than the completion of the first year of the high school course.

R. O. SMALL,
E. A. COOLEY,
M. B. KING.

PART-TIME INDUSTRIAL CLASSES.

It should be understood that two distinct kinds of part-time or continuation classes exist at the present time. One is that created by the provisions of the so-called Wilmot Law which makes it possible for any city in the state to organize day continuation classes and to compel working children under 16 years of age who have not completed the eighth grade to attend not less than four nor more than eight hours per week. This law aims to further the general education of children who have left school before completing the grammar school by providing opportunities for instruction in the day time instead of in the evening.

The other type of part-time class is that in which instruction is given in the trades and industrial, agricultural, salesmanship and homemaking subjects with the object of increasing efficiency and wage earning power, to pupils over 14 (now 15) years of age who are employed during the day. Inasmuch as very few boys under 16 years of age are employed in skilled trades, attendance in these classes is largely voluntary. Voluntary part-time classes are also organized for workers over 16 years of age. The present survey deals with the second type.

It may help to an understanding of the general situation in regard to part-time classes if some account is given of the conditions under which they came into existence in New York City.

The following statement as to the development of the continuation work is taken from the report of the City Superintendent of Schools for 1915-16:

"Continuation classes as now conducted in New York City are a natural outgrowth of the evening school work. It has been found by long experience that evening school instruction is not very profitable for working children under 16 years of age. At the same time it is evident that this large group of young workers is very much in need of further education. The Wilmot Law, passed in 1913, makes it possible for any city in the state to organize day continuation classes and to compel working children under 16 years of age who have not completed the eighth grade to attend not less than four nor more than eight hours per week. Before making the law effective in this city, it seemed wise to see what could be done on a voluntary basis, that is, with the consent of employers and employees. This gave an opportunity to start in

a small way, and to develop an organization gradually and on the basis of experience, instead of attempting to work out in advance a theoretical organization and then apply it as might be possible. It also gave opportunity to accustom employers to the aims and purposes of continuation classes before compelling the attendance of young workers for a certain number of hours per week.

"Even before any continuation classes were established for working children 14 to 16 years of age, steps were taken which led to the organization of such classes for older workers. The first step was the organization of evening classes in the establishments of the employers. For example, in 1913, an evening class in English to foreigners was authorized by the Board of Education in the Hotel Astor, at the request of the management. It was more convenient and more satisfactory to conduct the class in the hotel as an annex of evening school 17, Manhattan, than in the school itself. The next logical step, which was soon taken, was to open day classes for workers in their places of employment, conducted during such hours as the employees could most conveniently be excused from work.

"From these two movements, both growing out of the evening schools, in connection with the growing interest in vocational education, have come the day continuation classes now carried on in the City of New York.

"The first day continuation class authorized by the Board of Education was in the department store of Abraham & Straus, Brooklyn, in 1913. The second class was in the department store of Bloomingdale Bros., Manhattan. This was authorized January 28, 1914, and opened the same week. During the following month classes were authorized in the department stores of Frederick Loeser & Company, and A. D. Matthews' Sons, in Brooklyn. Before January 1, 1915, arrangements were made with ten department stores, three hotels, two candy factories, and three or four large manufacturing plants and repair shops for the opening of similar classes. For various reasons classes were not organized in all these establishments, but in nearly all. The growth has continued steadily. During the school year ending June 30, 1916, the largest number of classes in operation at one time was 38."

The Board of Education passed resolutions September 16, 1914, authorizing the organization of co-operative and part-time industrial classes, appointing Associate City Superintendent Dr. J. G. Haaren to take charge of the work of organizing and supervising these classes. In October, 1914, Dr. Schneider was appointed to act in an advisory capacity to Dr. Haaren, on the understanding that he should spend one week each month in New York City. At a conference with the executive officers of the city government and Board of Education "It was determined that the amount of \$236,500 be set aside for the inauguration of

vocational courses, and that this money should be released by the Board of Estimate when plans for its distribution had been approved by the Board of Education." Of this sum "It was agreed that a sum not to exceed \$100,000 was to be used for the particular experiment inaugurated with the advice of Dean Schneider," i. e., co-operative and part-time industrial classes.

In a report made August 20, 1915, Dean Schneider says: "There are three things essential to success in co-operative and continuation school work—a desire on the part of the school men really to do it; a thorough understanding of the basic principles and a carefully planned organization."

Aims, Types, Definitions: The following definition of continuation schools is quoted from Dean Schneider's report to the committee on school inquiry: "Under the continuation system the employer releases his employees of school age for a period of time (i. e., one-half day or a whole day) per week to attend the public school for definite mental instruction."

The following statement is from the report on continuation and co-operative classes presented by Dr. Haaren to the Board of Education November 10, 1915: "Continuation classes are concerned with persons who are in industry and who have consequently left school. Continuation classes are of various kinds. Some classes receive instruction designed to increase the skill of workers in the industry, while others receive instruction planned to remedy defects in early education. A machinist's apprentice may need instruction in shop mathematics, or mechanical drawing, while a young man or woman engaged in a department store in a minor capacity may require greater skill in the three R's. It may be that a machinist, as well as a department store employee, or one in a hotel, needs to learn elementary English. To supply what is needed to increase civic and industrial efficiency, particularly of the lower paid workers, is the function of the continuation class. Continuation classes are not intended solely for the benefit of the industry. Classes with such an aim should be organized and conducted by the industry itself."

As the State of New York provides liberal state aid for part-time industrial classes, we must take into consideration the stated aims, definitions and requirements, as set up by the state. The following is quoted from Bulletin 542, of the State Education Department: "Part-time or continuation schools are those in which instruction is given in the trades and industrial, agricultural and homemaking subjects to pupils over 14 years of age

who are regularly and lawfully employed during part of the day in any useful employment or service, and the subject of the instruction must be supplementary to the practical work carried on in such employment or service." This definition has been interpreted to include continuation classes in which salesmanship is taught.

Continuation and Part-Time Industrial Classes: The following table shows the total number of the continuation and part-time industrial classes under the Board of Education for the week ending April 21st, 1917:

REPORT OF CONTINUATION CLASSES—WEEK ENDING APRIL 21,

1917

Voluntary Classes		No. of Classes	Subjects Taught	Average Attend.	Hours Taught Per Week
Firms in Which Classes Are Conducted	Designation of Classes				
Abraham & Straus.....	Girls, women	1	Com. Br.	20	7½
Bloomingdale Bros.....	Girls, women	1	Com. Br.	20	5
F. Loeser & Son.....	Girls, women, boys	2	Com. Br. (4)	42	4
A. I. Namm & Sons.....	Girls, women	2	Com. Br. (13)	40	5
R. H. Macy & Co.....	Girls, women	1	Com. Br.	23	10
Greenhut & Co.....	Girls, boys	2	Com. Br. (19)	37	5
H. C. F. Koch.....	Girls, women	2	Com. Br.	39	4
Lord & Taylor.....	Girls, women, boys	2	Com. Br.	38	5
Gimbel Bros.....	Girls, women	1	Com. Br.	21	5
James McCreery & Son..	Girls	1	Com. Br.	22	5
Oppenheim Collins & Co.	Girls, women	1	Com. Br.	20	8
(Manhattan)					
Oppenheim Collins & Co.	Girls, women	1	Com. Br.	22	8
(Brooklyn)					
Floersheimer & Co.....	Girls, women	1	Com. Br.	18	4
J. Kayser & Co.....	Girls	1	Com. Br. (2)	23	4
G. Bamberger & Co.....	Girls	1	Com. Br. (2)	20	2
Educational Alliance.....	Men, women, girls, boys	3	Eng. to For.	61	10-8
P. S. No. 4, Bronx.....	Women, men	1	Eng. to For.	17	8
Bronx House.....	Women	2	Eng. to For.	42	10
Kops Bros.....	Women, girls	1	Eng. to For.	15	5
Long Island R. R. Co....	Boys, men	2	Trade	27	4
Richmond L't & R.R. Co.	Men	2	Trade	29	4
Baltimore & Ohio R. R..	Boys	1	Trade	6	3
General Electric Co.....	Boys, men	1	Commercial	14	5
Metropolitan Eng. Co....	Boys, men	4	Trade	55	3
Bklyn Navy Yard, Bklyn.	Boys, men	9	Trade	195	8

Compulsory Continuation Classes					
Firms in Which Classes Are Conducted	Designation of Classes	No. of Classes	Subjects Taught	Average Attend.	Hours Taught Per Week
P. S. No. 7.....	Boys, girls	8	Com. Br.	631	4
P. S. No. 7.....	Boys, girls	7	Prevocational	...	..
P. S. No. 65.....	Boys, girls	7	Com. Br.	403	4
Bernard Ullman Co.....	Girls, boys	1	Com. Br.	27	4
Jas. A. Hearn & Son.....	Girls	3	Com. Br.	68	4
		26		1129	..

Continuation Classes City Employees					
City Employees	1	Ele. Algebra	15	5	
City Employees	1	Plane Geometry	12	5	
City Employees	2	Bookkeeping	22	3	
City Employees	1	Ele. Typewriting	37	4	
City Employees	1	Adv.Type.&Sten.	28	2	
City Employees	2	Element'y Sten.	41	2	
City Employees	1	Int. Stenography	34	2	
City Employees	2	Eng. Comp. 1, 11	26	2	
		10		215	..
Grand Total.....				2210	

Scope of Survey: The survey of continuation classes was limited to such classes as might be eligible for state aid, i. e., part-time industrial classes, including salesmanship classes. The provisions made for state aid state definitely that "The subjects of the instruction must be supplementary to the practical work carried on in such employment or service." The state law does not provide special aid for the general continuation work.

The following list of firms having part-time industrial classes coming under the above definition was furnished by Dr. Wm. L. Ettinger, Associate City Superintendent in charge of vocational work:

Baltimore & Ohio R. R. Shops, Clifton, S. I.
 Long Island R. R. Shops, Morris Park, L. I.
 Metropolitan Engineering Co., Brooklyn, N. Y.
 Brooklyn Navy Yard, Brooklyn, N. Y.
 Richmond Light & R. R. Co., Livingston, S. I.

All the classes studied are listed as voluntary classes by the Board of Education because the pupils enrolled in these classes

are above the compulsory school age. In all of them, except one, however, the employer compels certain employees to attend.

PART-TIME INDUSTRIAL CLASSES AT THE BROOKLYN NAVY YARD.

Organization: The part-time industrial classes at the Brooklyn Navy Yard were started February 26, 1917. These classes were visited by members of the survey six weeks after the work was organized. There are 227 boys enrolled. Their ages range from 15 to 22 years. Of these boys none had graduated from high school, 45 had attended high school, 64 had done no work beyond the eighth grade, 118 had not completed the work of the eighth grade. Of the total number of boys 59 had attended night school and two had taken correspondence courses.

Every boy in the classes is regularly apprenticed to some specific trade in the Navy Yard. The apprenticeship term is from three to four years, depending on the ability of the boy; about 30 per cent finish their apprenticeship in three years. The apprentices are given a semi-yearly examination by the officers of the Navy Yard and the part-time industrial teachers. If the boy does not do satisfactory work in the examination or in the shops he is dismissed or held back. The Navy Department officials compel all the apprentices to attend the part-time industrial classes, eight hours a week from one o'clock to five o'clock on two days of the week and they are paid the regular wage for the time spent in the class. The classes are under the direct supervision of an officer of the Navy Yard assigned for the purpose. A petty officer is present continuously during the sessions of the classes and is responsible for the attendance and to some extent the discipline.

For the purpose of the part-time industrial class work the 227 boys were organized into the three groups called "A", "B" and "C" groups, representing the ship construction, machinery division and woodworking trades. Classes in each group are arranged so that only one-third of the boys are out of the shops at one time.

It is the aim of those in charge to group the apprentices in the classes as far as possible, according to their year of apprenticeship. This has been done in classes No. 2 and No. 3 and partially in the other class. The table showing the distribution of

the boys in regard to groups, classes and trades was made up from a report dated February 26th, 1917, of the supervisor in charge.

TABLE SHOWING THE DISTRIBUTION OF PUPILS BY CLASSES AND TRADES IN THE BROOKLYN NAVY YARD PART-TIME INDUSTRIAL CLASSES

Trades		Class 1.	Class 2.	Class 3.	Trade Total.
<i>Group A:</i>					
1.	Shipfitter	12	27	17	56
2.	Chipping and caulking.....	0	4	2	6
3.	Sheet metal working.....	8	5	0	13
4.	Shipsmith—ship blacksmith.....	3	1	8	12
5.	Plumber	3	3	2	8
6.	Boilermaker	3	0	1	4
Class Totals.....		29	40	30	99
<i>Group B:</i>					
7.	Boatbuilder	4	13	12	29
8.	Joiner	5	2	0	7
9.	Shipwright	2	1	5	8
10.	Patternmaker	2	0	0	2
11.	Painter	2	2	0	4
12.	Sailmaker	0	2	0	2
Class Totals		15	20	17	52
<i>Group C:</i>					
13.	Machinist	9	15	5	29
14.	Electrician	16	14	7	37
15.	Coppersmith	1	1	1	3
16.	Die sinker.....	2	0	0	2
17.	Moulder	1	2	2	5
Class Totals		29	32	15	76

An important element in the success of part-time industrial work and one which is emphasized by the rules of the State Education Department in order to secure state aid is that the school work of the class shall be directly related to the shop work. This can be done, most successfully only when a specific trade is taken as the organizing unit. When it is necessary to group apprentices from two or more trades together the classes should be small enough so that the instruction can be individual. A study of the above table will show that neither of these principles is present in the organization of most of these classes.

Courses of Study: The subjects taught are mechanical drawing, mathematics, mechanics and English, one and one-quarter hours being given to each subject with five minutes between classes. On account of the short time that these classes have been in existence no definite course of study has been adopted.

Relation Between School Work and Shop Work: In the mechanical drawing classes the work observed consists of geometrical exercise drawing. In the mechanics and English (same period and teacher) the work observed consisted of a formal lecture on some formula of mechanics or some phase of metallurgy, and the English work dealt with a written summary of the lecture. One lesson observed in this class was on the blast furnace, a topic full of possibilities for interesting correlations. During the entire lesson the instructor used no demonstration materials, models, blue prints, lantern slides, blackboard drawings nor did he make any reference to the several cupolas in the Navy Yard. In mathematics the work observed consisted of review exercises and demonstrations of the fundamental operations. No text books were used in any of the classes. In the teaching observed there was very little correlation between the class work and the daily work of the boys, and none at all with the specific trade to which the boy was apprenticed. The methods used were largely those of formal teaching with a very few practical applications brought in afterwards as incidental. It seems surprising that in such a rich environment as the Navy Yard, with such hearty co-operation on the part of the officials, that so little endeavor was made to use the environment and the experiences of the boys as part of the teaching process. At the time of the survey none of the teachers had visited the shops or talked to the foremen in the shops, or visited the boys at work, except one who is regularly employed in the Navy Yard.

Teachers: There are three teachers employed by the Board of Education for the part-time industrial work in the Navy Yard. They are rated as substitute teachers and teach at the Navy Yard four hours per day. They are paid at the rate of \$6.00 for the four hours. All are fully occupied at other business in the mornings. One teaches two mornings each week for the Board of Education in other part-time industrial classes and works four mornings in a machine shop. Another is regularly employed at the Navy Yard. The third is temporarily employed at civil

engineering work. Two teachers have engineers' degrees, the other has completed three years' work toward the bachelors' degree. All three teachers have had practical experience in the industries and at present are occupied part of the time in practical work. The supervisor from the Board of Education visits the classes twice a week, holding conferences with the teachers and observing the work of the classes.

Building Equipment, Supplies: All the classes are held in the large social hall of the Navy Yard. This makes the teaching somewhat difficult as the attention of the students is being continually distracted by the other classes. This condition is soon to be remedied by installing movable partitions.

The equipment is satisfactory in most respects and is being added to and improved continually by the officials of the Navy Yard.

All supplies for these classes are obtained from the Navy Yard stores, so that these teachers avoid the delay usually attendant upon obtaining supplies from the Board of Education store room.

Attitude of Employers: The classes are visited every day by the naval officer in charge, another subordinate officer being present most of the time. The Navy Yard officials are very enthusiastic about the part-time industrial classes, and are willing to co-operate in every way to make the work a success. Personal interviews were held with the four officials directly concerned; one of them expressed himself as feeling that the teachers were not yet in touch with the real problems and needs of the boys in the classes; another one said, "Everything in the Navy Yard is at the disposal of these classes and their teachers. They can go anywhere and use anything in the yard."

THE PART-TIME INDUSTRIAL CLASSES AT THE LONG ISLAND RAILROAD SHOPS, MORRIS PARK, L. I.

Organization: The part-time industrial work was organized in these shops on June 14th, 1915. There are two separate classes, one from eight to ten, Monday and Wednesday mornings, the other from ten to twelve on the same days. The classes are conducted fifty weeks in the year. One class of twelve boys was composed of machine shop apprentices, the other class of thirteen boys included electricians, blacksmiths and pattern-makers' ap-

prentices. The apprentices attending these classes are employed in the general repair shops of the railroad and are given a splendid opportunity to secure a broad shop training. The boys are compelled by the employer to attend these classes and are paid their regular wages for the time spent in class.

The previous education of the boys in these classes ranges from the sixth grade to the second year in high school. They were from 15 to 22 years of age.

Course of Study: An attempt was made to secure a course of study from the teacher but one could not be obtained. Three subjects were taught by one teacher to all classes; mechanical drawing and blue print reading one period each week, mathematics one-half period per week and English one-half period per week. Instruction in mechanics was also being given at intervals.

Relation Between School Work and Shop Work: The work in mechanical drawing was largely individual owing to the varying rate of progress of the pupils. The larger part of the work was being done from blackboard sketches and other drawings. There was very little evidence of drawings of shop models, tools or machines, and none of locomotive parts.

In the work in mathematics the difference in the previous education of the boys showed up strongly. To many of them the work was simply a review of what they had done in school; to others it was far too difficult. There was very little individual teaching.

On the day that the writer visited this shop a lecture had just been given in the mechanics class on the theory of the gas engine. On inquiry it was found that no gas engines were used or built in the shops. The English work was given at the same time as that in mechanics and consisted of note book work and drill in oral expression.

The same teacher has been employed for these classes for the past six months. Up to the date of the survey he had not visited the shops, or the boys at work, the superintendent or the foreman. He is employed by the Board of Education for the work, two mornings each week, from 8 to 12 for which he is paid \$6.00 per morning. He is also employed by the board every afternoon, teaching other part-time industrial classes, his other mornings being spent in machine shop work. He has had ten years' practical experience as draftsman, engineer and machinist. Although

the classes have been in operation for two years, a system of tests and reports to the shop superintendent has only just been started. This was done at the urgent request of the shop superintendent, who made this request because of his impression that the company was not deriving the benefit that it should from the class work.

Rooms and Equipment: The room provided for these classes is unsuited for school purposes, being a portion of a paint shop, dark, dirty and noisy with a very disagreeable odor of paint. The benches on which the drawing is done were decidedly shaky, it being practically impossible to do good work on them.

Attitude of Employers: Interviews were held with the superintendent of the shop and with the foreman of the machine shop. Both expressed an earnest desire to make the work of the part-time industrial classes more successful. The superintendent expressed himself as not being entirely satisfied with the work of the class. He expressed a desire to have it more thoroughly organized in the direction of systems of testing, grading and promotion which should measure the progress of the boys. Both foreman and superintendent felt that the work thus far had not been of much value to them in a practical way due in part to the fact that the boys did not remain long with the firm.

THE PART-TIME INDUSTRIAL CLASS OF THE BALTIMORE AND OHIO R. R. SHOPS, CLIFTON, S. I.

Organization: This class was organized September, 1914. The sessions are from 7:15 to 8:15 every morning in the week, making a total of six hours per week for all apprentices. The enrollment was low at the time of the survey on account of abnormal trade conditions, it being difficult to get boys to start the four years' apprenticeship course at the beginning wage.

Classification of Pupils: All the boys are regularly apprenticed to specific trades in the shops. They are compelled to attend by the company and are paid their regular wage while attending class. Of the eight apprentices at present in the class, six were machinists' apprentices, one a carpenters' and one a boiler makers' apprentice.

Courses of Study: Mechanical drawing is taught on Mondays, Wednesdays and Fridays, mathematics on Tuesdays, Thursdays and Saturdays.

Relation Between School Work and Shop Work: In mechanical drawing the work of the class is closely related to the specific trade of the boy, the machinists' apprentices drawing machines, engines and parts; the carpenter apprentices drawing frames for buildings, construction work, etc., the boilermakers' apprentices drawing parts of locomotive boilers and developing patterns, the drawings being made almost entirely from parts borrowed from the shops. The work in mathematics is of a practical character and related to the trade, the method being to develop the practical use and need, show methods of solving, then state the formula and develop short cuts, with use of tables. The work in both classes is entirely individual and the standards of work are high. The books used as reference books in the mathematics class are: "Shop Mathematics," Holton; "Practical Applied Mathematics," Hale; "Mathematics for Machinists," Burnham; "Shop Problems in Mathematics," Breckenbridge, and the texts of the Baltimore and Ohio apprentice course of Mt. Clair, Md.

Teachers: Two teachers are employed for this work by the Board of Education, one for mathematics and one for mechanical drawing, both teach three hours per week. They regularly visit the shops, are well acquainted with all the foremen and know what each boy is doing in the shop. Both have had some practical experience in the trades and are regularly employed during the day by the Baltimore and Ohio Railroad Company; one is chief clerk to the master mechanic, the other is draftsman in the same department. Each has worked out a course of study to meet the needs of the boys, their chief aid being the apprentice courses from the Baltimore and Ohio Apprentice School at Mt. Clair. On the other hand neither of these teachers has ever attended any conference of part-time industrial class teachers or visited any other part-time industrial classes.

Equipment: The classes are held in an ordinary passenger car which stands on a convenient side track. Drawing tables are fitted over the backs of the seats and the car is well lighted, heated and ventilated. The company furnishes all the blue-

prints, tracing paper, blue-print paper and tracing cloth. The Board of Education furnish drawing boards, paper and instruments. The teachers are given any extra time necessary to prepare material for the class and are allowed to use any part of the shop equipment or material desired. These teachers have visited evening classes at Pratt Institute, Murray Hill Evening Trade School and the Dickinson High School.

Attitude of Employers: The master mechanic and foremen visit the class regularly and know what each boy is doing; the representative of the Board of Education visits the class once about every three weeks. The company gives prizes of books for good work and pays the expenses of a trip to their other plant at Mt. Clair, Maryland, for the best boys. The attitude of the representatives of the company was all that could be desired. They visit the class regularly, giving encouragement, substantial help and constructive criticism. They expressed themselves as being perfectly satisfied with their teachers and with the work which they were doing. They would be glad to start classes in industrial chemistry and applied physics.

THE PART-TIME INDUSTRIAL CLASSES OF THE RICHMOND LIGHT & RAILROAD CO., LIVINGSTON, S. I.

Organization: These classes were established by the Board of Education, November 10, 1914. The hours are from 7 to 9 Monday, Wednesday, Thursday and Saturday mornings.

Student: The students are all over nineteen years of age and attendance in the class is voluntary, the class being open to any employee who cares to come. The firm pays the regular wage for the time spent in class, the estimated average wage being about 30 cents per hour. The total number of employees is 150, the average number enrolled in the continuation class is 38, with an average attendance in each class of 15. The trades represented in each class are electricians, machinists, pipe fitters, riggers, repair men, construction men and meter men, with oilers and helpers of various kinds.

Courses of Study: Elementary mechanical drawing is given on Monday; advanced mechanical drawing and blueprint reading, cost and quantity estimating on Wednesday; mathematics on Thursday; elements of steam and electricity on Saturday.

Relation Between School Work and Shop Work: The teaching in both classes in mechanical drawing was entirely individual, each student being given what he needs and wants, and advancing as rapidly as his ability allows. The purpose of the class is not to make draftsmen, but to enable them to make freehand mechanical sketches; to read drawings and blue prints; to figure quantities and to estimate costs. Some were working on the simple orthographic projections, others on machine drawings, others on building plans and still others were estimating costs and quantities; all in the same class. No text books were used, samples being taken from the daily work and the operations of the plant. In mathematics the work was partly class work and partly individual, fundamental algebraic operations and simple equations were demonstrated and applied immediately to practical problems. The work in elements of steam and electricity is given in the same way. The chief reference books in these two classes were "Mathematics for Machinists," Burnham; "Elements of Electricity," Timbie.

Teachers: Two teachers are employed by the Board of Education, one for the mechanical drawing, four hours per week, one for the mathematics and elements of steam and electricity, four hours per week; both are ranked as substitute teachers and are paid \$1.50 per hour. Both are regular employees of the company, one as chief operating engineer, the other a draftsman having charge of the construction work.

Rooms and Equipment: Two rooms in the office building are used for the continuation class work. They are roughly furnished, but seem to be entirely satisfactory for the purpose of the class work. The lecture room equipment consists of one small blackboard and several rough board benches, with a set of shelves for storing demonstration material. The mechanical drawing room equipment consists of several rough board tables for drawing, one table for the teacher and a set of small shelves for demonstration models. Both rooms are well lighted and ventilated.

Attitude of Employers: The employers are very favorable to the continuation class idea, and if for any reason the classes decrease in size the superintendent and foreman go around the shops and urge the men and boys to attend. The teachers are allowed all the extra time they need to prepare for their class work and

the services of other employees is freely given to prepare any material needed. The classes are supervised very closely by the employers, being visited nearly every day by some official or their representative and the teacher holds daily conferences with the superintendent. The representative of the Board of Education visits the class about once every two weeks.

PART-TIME INDUSTRIAL CLASSES OF THE METROPOLITAN ENGINEERING COMPANY, BROOKLYN. N. Y.

Organization: The Metropolitan Engineering Company, of Brooklyn, has four continuation classes, the hours being from 4 to 5:30, two classes meeting on Monday and Wednesday, and the other two on Tuesday and Thursday. The classes were organized September 13, 1915, and the boys are required by the company to attend them. Most of the boys work on piece work, but are paid a flat rate for two-thirds of the time spent in class. This rate of compensation varies from fourteen to twenty-five cents per hour. The company makes a very extensive line of electrical parts for use in construction work. The classes have an average attendance of seventy-eight and the boys' ages vary from sixteen to twenty-two years. They are not learning any specific trade, but are doing routine work requiring a considerable degree of manual dexterity, for which they receive good wages.

Most of the boys were working at semi-skilled work. Their job can in no way be looked upon as a trade and it offers very little opportunity for advancement to skilled work with this firm, or any other firm. Neither can it be looked upon as a suitable occupation for adults. This makes the problem of related work quite difficult. It also raises the question as to whether the instruction can be considered as trade extension work.

Courses of Study: The class work consists of mechanical drawing one and one-half hours per week; shop arithmetic three quarters of an hour per week; English three-quarters of an hour per week. Complete syllabi for these courses have been worked out by the supervisor in charge of these classes.

Relation Between Class Work and Shop Work: The type of work the boys perform in the shop makes it difficult to relate the class work very closely to the shop work. In the mechanical drawing class, however, an attempt was being made to make the work practical and related to the shop work. The models used

were largely those that the boys were working with in the shops. There was no geometrical drawing, but plenty of freehand orthographic sketches. A few drawings were made that were copies of other drawings. In the shop arithmetic class the work was primarily a review of the regular work pursued in the grammar grades. Very little evidence could be seen of any correlation with the work of the boys, or of the products of the firm. The English was to an extent correlated with the daily work of the boys.

Teachers: At the time of the first visit to these classes two new teachers were being installed, one class having had three different teachers in the previous four weeks. There had been an entire new force of teachers in the previous two weeks. At present there are two teachers employed six hours each per week by the Board of Education for these classes. They are paid \$1.50 per hour for this teaching. They teach in other schools during the remainder of the day.

Room and Equipment: The room assigned to the class is satisfactory for the purpose, it being the best in all the part-time industrial schools visited. It is suitably equipped with chairs, drawing tables, blackboards, and cases. A partition is to be built in the middle of the room, making it into two separate rooms.

Attitude of Employers: The officials of the company interviewed, the superintendent and the foreman are all very enthusiastic about the part-time industrial work. The classes were organized at their request. When advertising for help they make a statement that they conduct a part-time industrial class and that the quality of the applicants for positions had improved very much since the classes were started. They expressed an entire willingness to do anything to improve the work of the classes. They feel that the Board of Education is not properly supporting the work, in that they have failed to supply competent teachers who understand the part-time industrial class. They expressed a willingness to pay the entire salary for the teachers themselves, if good ones could be obtained; also to employ them regularly in the factory or office for full time, if that would assure good teaching. They are willing to start two more classes, if the Board of Education will supply good teachers. They favor the establishment of courses in related elementary electricity, correlated physics and chemistry and a course in the study of material. They advocate not more than ten boys to one teacher, as they feel that

this limitation is necessary to obtain good results in this type of work. The company supplies to the classes complete files of the "American Machinist," "Electrical World" and "Iron Age"; but so far the teachers have made no use of the magazines in the class room.

The classes are visited nearly every day by a representative of the firm and about five times a month by a representative of the Board of Education.

SUMMARY.

The findings of the survey of the part-time industrial classes show the following:

1. That the part-time industrial work represents but a small part of industrial instruction offered in New York City. The report for the continuation classes for the week ending March 31, 1917, shows that there are 344 students enrolled in the part-time industrial classes. This number is about 16 per cent of the total number of pupils in continuation classes.

2. That certain conditions in this work arising from the fact that many classes are made up of pupils from different trades or branches of the trade make it difficult to correlate intimately the instruction with the shop experience of the pupils.

3. That the teachers of these classes receive practically no specific preparation for the special problems of this type of teaching.

4. That the salary and assignment of work render it difficult to obtain men with special training for these classes.

5. That the teachers who are employed in the shops of the establishments offering courses have uniformly acquainted themselves with the shop work of the pupils. At the time of the survey, few of the other teachers, however, had visited the shops, or the boys at work.

6. That the employers favor the part-time industrial classes and are working for their improvement.

7. That the contribution of the employers in apprentice wages and cost of materials amounts to more than that spent by the Board of Education for salaries and materials.

REPORT OF THE ADVISORY COMMITTEE OF PART-TIME INDUSTRIAL CLASSES

Part-time industrial classes, as conducted in New York City, may be considered, under two heads: (1) Compulsory classes organized under the provisions of the Wilmot law for children who have been granted working papers but who have not graduated from the elementary school, and (2) voluntary classes for those who have fulfilled the compulsory school requirements and who are employed in occupations for which it is possible and desirable to give specific supplementary training, calculated to better fit the employees for the positions in which they are now employed, and for advancement to better positions.

While the report of the survey which was submitted to the committee has dealt with but the second class of young workers mentioned above, your committee nevertheless feels it to be desirable at this time to emphasize the great need for providing a scheme of continued education for all boys and girls between the ages of 14 and 18 years who leave school and go to work.

No comprehensive or fully adequate system of education can permit thousands of young people who, at 15 years of age, have reached but the end of sixth grade, or who are merely 14 years of age though having finished the eighth grade, to go out into industry upon a single program of mere employment.

The fact is deserving of great emphasis that young people, even under the most favorable circumstances, cannot be sufficiently well educated and otherwise developed so that by the end of their thirteenth year, or during their fourteenth year, they may be permitted in large numbers to enter industry upon the terms of opportunity that industry now offers without grave danger to themselves and to society.

Legal restrictions upon hours of labor of children afford some protection. A few further legal restrictions afford a measure of protection from physical accident and minimize the moral hazard. And yet some of these beneficent restrictions serve to increase the educational hazard in that they narrow the field of choice of work of these boys and girls to the educationally "denatured" juvenile jobs so frequently described as "dead end" or "blind alley."

These juvenile jobs are not, as a rule, beyond the strength and capacity of boys and girls to master. They are of kind where youth is an asset. They are frequently relatively well paid. The danger lies in the fact that, with rare exceptions, they do not provide an experience that is useful as a preparation for better paid adult positions, which these young people must later enter if they are to be adequately self-supporting, and that, on the other hand, as a rule they make no demands upon the education with which the boys and girls come to them. As a result, the very elementary education—the minimum essentials of which have been provided at great expense by the community—is sloughed off to an alarming extent during these first years out of school.

If valid and necessary to make this investment in education, in the first place, it is imperative that steps be taken to conserve the investment in the second.

Another serious defect to be remedied arises from the fact that, during the years spent in the kind of employment of which we are speaking, neither parents nor employers are doing anything, except in special instances, to stimulate the young people to adopt a forward-looking program for themselves, and indeed often unintelligently and even selfishly oppose their efforts, when, by chance, they make the effort.

The community has undoubtedly the right to fix the terms upon which minors may enter industry. The community just as surely is under obligations to provide further part-time educational opportunity and guidance during this most critical and formative period between the ages of 14 and 18 years.

It requires no elaboration to convince anyone of intelligence that the initial entrance into industry, made at a period which coincides with the otherwise most critical period in the lives of boys and girls, is no time for the educational machinery to abandon them to their own devices and the blind forces of industry.

Legislation, and the public school alone, can deal adequately with the problem, and therefore upon the public school authorities devolves a great responsibility. To fail to act would be most inconsistent with the social claims of the modern school system, and would fall far short of educational statesmanship. The schools for the masses must not cease where those for the favored few begin.

The arguments for this work are by no means exhausted. Attention might be called to the fact that thousands of the boys and girls for whom it is asked that this part-time instruction

shall be provided, are entitled to sit five days a week in the public school and have the public pay the bill. Instead, they are at work earning millions of dollars yearly, which money they take into the homes of the most needy, where it both helps to support the families and to pay the taxes. They are also making their contribution to the industry, and must not be regarded as a burden upon industry, for, while we most often think of employers paying wages to employees, it is quite as correct to speak of employees paying a profit to employers.

Every consideration of justice, every prompting of generosity, every demand of efficiency in its best sense, requires that the problem of providing adequately for the continued education of the thousands of boys and girls leaving school at 15 years of age be met promptly and courageously, particularly in all of our large cities.

Turning to the second or voluntary group with which the report of the survey has to do the advisory committee is convinced that the city should maintain part-time industrial classes for these young people.

While the arguments set forth in regard to the necessity for further education of the first group apply equally well to the second, other factors set forth below influenced your committee in reaching its conclusions with regard to part-time industrial classes.

The individuals in the second group have definitely started upon an industrial career. The degree of success which will come to any of these individuals depends largely upon the degree of intelligence that they develop concerning the methods and activities of the trade in which they are engaged, that is, upon their knowledge of the mathematics bearing upon trade processes, upon the elementary scientific principles involved, upon their comprehension of technical processes, their acquaintance with the qualities and properties of materials used and upon their ability to deal with correlated factors, such as reading and making drawings and the interpretation of shop orders and reports.

As the industries are organized at present, there is little or no chance for an individual to secure systematic training in anything other than the manipulative side of the trade unless it be given by instructors employed for the purpose, and at a time definitely set aside. A few employers are willing to go to the trouble and expense to provide such instruction, the majority are not. Because of this it has become the duty of the public to

provide facilities for such instruction through the maintenance of part-time industrial classes. This can be done economically and efficiently only through the agency now organized to care for public instruction.

Any program which has to do with part-time industrial classes for minors employed in occupations for which it is possible to give specific supplementary training should be based upon the principle that there are three parties to be considered—the State, the individual and the employer.

The instruction in part-time industrial classes should consist in part of subjects such as drawing, mathematics, and science related to the industrial needs of the occupations in which the workers are employed, and in part of subjects which will contribute to the employee's intellectual, social and civic development.

It should also be noted that the development and advancement of the employee will depend fully as much upon the extent to which he is given the opportunity for breadth and scope of training inside the establishment as upon outside instruction.

The administration of the part-time industrial classes should be placed in the hands of the public school authorities, and should center in a director of industrial education who should have an assistant in specific charge of these classes. This assistant should have power of initiative in all matters relating to the part-time industrial classes, such as courses of instruction, location of classes, training and selection of teachers, equipment and supplies. Such a plan would clothe those who administer the work with sufficient power to meet the many exigencies which are sure to arise in connection with part-time instruction and fix responsibility for results.

From the reports submitted to your committee and from such observation as the committee has made, it feels that certain weaknesses of the part-time instruction as it exists at present is largely due to the lack of such centralized authority.

All part-time industrial classes should be organized as to trades and not as to time served in industry or educational qualifications or age of pupils. Because of the inevitable variations in age and previous school experience there should not be more than twenty students enrolled in a class at any one time. By limiting the number to this extent individual instruction which is essential can be provided.

To secure the maximum amount of benefit for the individuals

in a part-time industrial class it is essential that workers from one industry, trade or occupation be grouped together, rather than a number of workers from a variety of industries, trades, or occupations. The workers in a machine shop should be grouped together, workers from a woodworking shop should be grouped together. Workers from a woodworking shop and workers from an electrical shop should not be grouped together.

While the investigations of the survey and the report of your committee have been largely directed towards the few part-time industrial classes now in existence, your committee feels that the policy of the Board of Education should be to extend these classes wherever favorable opportunities can be found.

The development of part-time classes in the absence of compulsory legislative enactment is a matter of slow growth in our individualistic communities. If this work is to be extended, steps should be first taken in industries representing large numbers of young workers and where there exists great need of trade extension instruction. The consent of some sympathetically disposed employer for the beginning of part-time classes with his employees should be secured. After such a beginning, efforts should be made through employers, associations and otherwise to secure the consent of all employers in the trade or industry in which the work has been started to release their employees for such instruction during a portion of the working day.

Finally it is obvious that part-time industrial classes cannot always be conducted in commercial establishments, but must be provided for in part at least in school buildings or rooms otherwise secured for the purpose.

Signed,

R. O. SMALL,

E. A. COOLEY,

M. B. KING.

RECOMMENDATIONS OF THE INDUSTRIAL EDUCATION SURVEY COMMITTEE.

ADMINISTRATION.

Based upon the foregoing findings, it is recommended:

That the administration of industrial education in the public schools of the city center in a director of industrial education responsible to the city superintendent of schools and the board of superintendents.

That the field covered by the director of industrial education be confined to such schools as meet the requirements for state aid and shall not include pre-vocational work, manual training and compulsory continuation school work.

That the director of industrial education be entrusted with as large authority and responsibility as is practicable in the administration of his work.

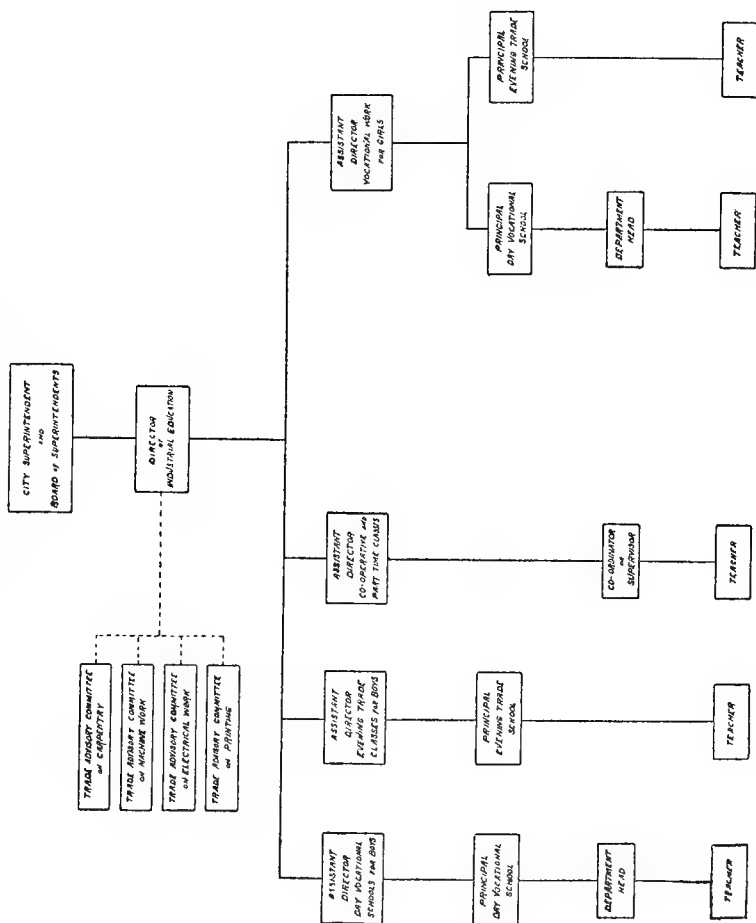
The committee feel that the Board of Education, the city superintendent and the board of superintendents should recognize that their relation to the director of industrial education would be different in character from their relations with directors of academic branches. While school superintendents have experience and authority in the academic branches, they are usually without experience or special knowledge with respect to industrial education. They should therefore allow a more free-hand to the director of industrial education than they might be willing to grant to the supervisor of high schools or of branches of the work in elementary schools.

That four assistant directors be provided to assist the director of industrial education as follows: An assistant director of day vocational schools for boys; an assistant director of evening trade classes for boys and men; an assistant director of co-operative and voluntary part-time classes; and an assistant director of vocational work for girls.

That according to the terms of the accompanying chart the assistant director of day vocational schools for boys shall deal with the principals of such schools, the principals with the department heads and the department heads with the teachers.

That the assistant director of evening trade schools for boys and men shall deal with the principals of such schools, and the principals with the teachers.

ORGANIZATION CHART FOR ADMINISTRATION OF INDUSTRIAL
EDUCATION IN THE CITY OF NEW YORK
(ADVISORY COMMITTEE)



That the assistant director of co-operative and voluntary part-time classes shall deal with the co-ordinators of co-operative classes and the supervisors of part-time classes and these with the respective teachers.

That the assistant director of vocational work for girls shall deal with the principals of day vocational schools for girls which are or may be established; and with the principals of evening trade schools for girls, the principals of day schools with department heads, these department heads and the principals of evening schools with the teachers.

That in order to insure the essential co-operation of the trades and industries in the administration of industrial education advisory committees, consisting of employers and employees be appointed by the Board of Education for each of the trades of printing, carpentry, machine work and electrical work, such committees to consist of seven persons each, three of whom shall be selected from trade employers associations, three from labor organizations, and that these six shall nominate one additional member who shall be a layman. In the first instance two members from each of the above trade groups shall be appointed for a term of one year, two for a term of two years and two for a term of three years, and the lay member for a term of three years. Thereafter as the term of such members shall expire, the vacancies caused thereby shall be filled for a full term of three years.

It is clear that the function of such committees cannot legally be those of control or veto, but it also seems clear that if they are accorded very specific advisory powers and definite provision be made for the consideration of their recommendations the way will be opened for the exertion of a very real and important influence on their part.

That the relations of such advisory committees should be with the director of industrial education, and this officer should be instructed before action is taken upon such matters, to invite the recommendations of the committees as to the establishment of new industrial schools and classes; the selection of equipment; the content and length of the courses of study; the requirements for graduation and certification; the number of pupils admitted to day vocational schools.

Furthermore, where questions of policy are concerned the committee believe it is highly desirable that the Board of Education obtain the advice of these committees as the only means of guarding itself against the danger of losing touch with the changing conditions of the trade.

EMPLOYMENT AND LICENSING OF TEACHERS IN VOCATIONAL SCHOOLS.

The committee recommends:

That the board of examiners appoint a special committee for each distinctive trade for which there is need of teachers in either shop or related shop subjects, the members of the committee to be appointed for one year and to be re-appointed as long as their services are satisfactory and they are willing to serve.

That each committee consists of three members, one of whom should be a member of the examining board in order to correlate the work of the board and its special committee and two of whom should be persons experienced in their knowledge of the trade and of education for the trade.

That the two lay members of the committee be paid a per diem rate for the actual time given to the duties assigned them as herein described.

It is the conviction of the survey committee that the special committee on the certification of teachers for any given trade should be regarded only as an agency used by the board to assist it in the difficult and highly specialized task of obtaining competent instructors for the schools in the shop and related shop subjects of that trade and that all authority to pass finally upon the case of any applicant rests and should rest with the board of examiners. Furthermore, that the function of the committee should be to advise as to the conduct and standards of the examinations and recommendations in rating of applicants. All the papers regarding the applicant should be filed with the board.

That male applicants for licenses for teaching shop subjects should not be less than 25 years of age nor more than 40, and women applicants not less than 23 nor more than 40 years, which is the present regulation of the Board of Education for regular teachers, but that the proviso be made that this requirement should not apply to substitute teachers already in the service or to a successful teacher over 40 years of age desiring to enter the service in New York.

That the applicant should, if a man, present evidence of at least five years of approved and successful experience in industrial work subsequent to the period of his apprenticeship in the shop work which he desires to teach. That in the case of a woman, the applicant should present evidence of two years' successful experience in the trade or occupation approved by the committee or its equivalent; and demonstrate as the committee may determine her trade skill or knowledge.

That the teacher of a shop subject should be required to have at least a common school education, or its equivalent.

That three factors should be taken into consideration in passing upon the applicant; trade knowledge and skill, teaching ability, and general education.

That in examining applicants, the committee should avail itself of four different elements: written examinations, credentials, personal interviews, and practical demonstration.

Written examinations in the judgment of the committee are of relatively little value in testing the ability and the personal equipment of candidates. Such examinations can aid in determining the fitness of candidates to teach, but mainly to the extent that such examinations are limited to tests of general and trade knowledge.

Proper credentials should be given an important place in determining the fitness of an applicant. Affidavits as to trade standing and skill furnished by employers and fellow workers, diplomas, certificates, school records, correspondence school work, personal statements of former teachers, examples or records of actual work done, magazine articles or books written by the candidates; statements as to teaching ability based on previous service as instructor of apprentices or as a teacher, should all be acceptable as credentials.

A personal interview is necessary in estimating the qualifications of the applicant in such matters as appearance, personality, health, general intelligence and of social and economic outlook. It has also an important use supplementary to the written examinations and credentials in furnishing additional information concerning trade and teaching experience.

Practical demonstration should be used to supplement other tests whenever doubt exists as to either the trade qualifications or teaching ability of the candidate.

That all teachers of shop work employed on the basis later recommended who have not completed at least 120 hours in an approved teachers' training course be required to meet this minimum during the first three years of service.

That provision for such instruction be made by the public school authorities.

That the pay of all male teachers of shop work in day vocational schools be made seven dollars (\$7) a day for the first year of service, and that such teachers, upon the recommendation of the principal of the school and the director of industrial education, shall receive an annual increase in the per diem rate to be determined by the Board of Education, which shall make the annual earnings of such teachers not less than that provided by the present salary schedule for shop teachers in day vocational schools.

The present salary schedule for male shop teachers begins at \$1500 and progresses with an annual increase of \$125 until a maximum of \$2500 is reached.

That in the case of women teachers, as under the existing regulations of the Board of Education the probationary teacher who begins with a minimum of two years of trade experience, as what is known as a substitute or probationary junior teacher, be, after one year of satisfactory experience as a teacher of a trade subject, promoted to be a probationary second assistant; after a second year of such service, to be a probationary first assistant and after a third year of such service to be a regular teacher of the subject.

That the present schedule as given below in regard to salaries for these vocational teachers in schools for girls be approved:

Substitute head teacher (female), \$6.00 per day.

Substitute placement and investigation teacher (female), \$5.00 per day.

Substitute department vocational teacher (female), \$6.00 per day.

Substitute first assistant teacher of vocational or trade subjects, \$4.50 per day.

Substitute second assistant teacher of vocational or trade subjects, \$3.50 per day.

Substitute junior assistant teacher of vocational or trade subjects, \$2.50 per day.

Substitute teacher of sewing, \$4.00 per day.

Substitute in non-vocational subjects (female), \$0.50 per hour.

Substitute female teacher-clerk, \$4.50 per day.

Substitute trade-order teacher (female), \$3.50 per day.

Substitute assistant trade-order teacher (female), \$2.50 per day.

Substitute assistant female teacher-clerk, \$3.50 per day.

Substitute vocational or trade helper (female), \$1.00 per day.

That the Board of Education shall, upon recommendation of the advisory committee and the director of industrial education, authorize any shop teacher in a day vocational school to return to the practice of the trade for a period not to exceed six months, and for such experience as the advisory committee and the director of industrial education shall indicate, without loss of compensation.

Teacher of Related Subjects: That the applicant should at least have a high school education or its equivalent. He should have in addition as a minimum, 300 hours of additional instruction in the technical subject he desires to teach or an experience in the subject accepted as an equivalent. In order that he may

be able to apply his subject to the trade or occupation to which it is related, he should have had at least one year of actual experience in the trade or occupation concerned or one year of approved practical contact in some capacity with the trade or occupation.

That applicants who can meet the requirements set up for teachers of shop subjects or teachers of related technical subjects and can present evidence of at least one year of successful teaching experience in the subject for which a license is sought, may be appointed as regular teachers, subject to the regular probationary period.

Principal of a Vocational School: That to be eligible for a license as principal of a vocational or trade school, the applicant must have one of the following qualifications:

(a) "Graduation from a college or university recognized by the Regents of the University of the State of New York together with ten years' satisfactory experience in the practice of a trade and in teaching and supervision, provided that not less than two years of such ten years' experience shall have been in the practice of a trade, represented in the school. Five years of approved practical contact with the industry involved shall be considered as equivalent to two years in the practice of the trade."

(b) "Graduation from a college or university recognized by the Regents of the University of the State of New York, together with ten years' satisfactory experience in teaching or supervision, provided that not less than five years of such experience shall have been in teaching, supervision or investigation in vocational education in the field represented by the school."

CENTRAL SCHOOLS.

The Committee recommends:

The establishment of a Central School of Printing which shall provide trade extension courses for journeymen and advanced apprentices, part-time classes for younger apprentices and all-day pre-employment courses, and that such courses take the place of the instruction in printing at present carried on in the day vocational schools and evening trade schools.

That a Central School for the Metal Trades be established to include trade extension courses for advanced apprentices and journeymen, part-time classes for younger apprentices and pre-employment all-day courses, these courses to take the place of the instruction now given in the day vocational schools and evening classes maintained by the City.

That there be established one or two schools for the building trades; that trade extension courses for advanced apprentices and journeymen and part-time classes for younger apprentices be provided as well as all-day pre-employment courses, and that the work now done in the three vocational schools be concentrated in one or two schools, to be located as the demand shall indicate.

DAY VOCATIONAL SCHOOLS.

It is recommended :

That pupils admitted to these schools shall be at least 14 years of age and have completed at least the 6th grade of school. That they should be required to pass a physical examination based on the particular needs of the trade in question before entering the school.

That the numbers admitted should not exceed the point at which the number of graduates will be greater than experience indicates can be absorbed by the trade. That when the demand for admission to these schools exceeds the number so determined, competitive examinations aimed to test manipulative skill and general intelligence should be used as a basis of selection.

That courses provided in the day schools include shop training, directly related technical instruction, instruction desirable for citizenship and elements of general education. Material for courses of instruction in shop work and in related subjects are indicated in the analysis of the trades as given in the different surveys.

That the organization of courses of instruction remain on a basis that will require two years for completion as at present.

That the length of the school day be as at present, seven hours. That the entire school training of shop and academic instruction be continued for eleven months of the year.

That the number of pupils assigned to one teacher of shop work shall not exceed sixteen.

That in the schools devoted to the printing trades, machine trades and building trades, there shall be a certain amount of productive work, not for the sake of production, but because in the judgment of the committee experience in productive work is the only fully efficient method of trade instruction; that any productive work be limited to the needs of the vocational school system; that the recommendations of the advisory trade committees be particularly sought in regard to the character and

quality of this work; that such productive work should be supplemented by technical exercises of the laboratory type.

That before any further classes in day vocational schools are opened, equipment should be provided that is sufficient in extent to meet all the needs of the numbers under instruction and of a character and quality that conform to the requirements of modern trade practice.

EVENING TRADE CLASSES.

The committee recommends:

That the city continue the maintenance of the evening trade schools which deal with trade extension classes whose members are employed during the day in occupations to which the instruction offered in these classes is distinctly related.

That sixteen years be the minimum age of pupils admitted to evening trade extension classes.

That applicants for admission to trade extension classes be not accepted unless employed during the day in an industrial occupation approved by the trade advisory committee as directly connected with the trade in which trade extension instruction is offered.

That a nominal deposit be required in each course by all pupils registered in evening trade extension classes and that this deposit shall be returned to those pupils who complete at least 75 per cent of all sessions of the classes of which they are members.

That all evening trade schools be under the general direction of the person in charge of the entire system of industrial education.

That the organization of the trade extension courses follow the present plan which offers two nights per week for a definite number of weeks in any course of instruction in any specific trade subject, but not exceeding thirty weeks a year for any special unit, and that pupils should be given an opportunity to attend a second class in a related trade subject, with the consent of the director of industrial education.

That the minimum number of pupils in all trade extension classes be fixed at ten, and that the maximum number in shop classes be twenty, and in classes in trade drawing, shop mathematics and trade science be twenty-four.

That the advertising of evening trade extension classes be

controlled from the office of the director of industrial education and that all such advertising should emphasize courses and opportunities available for the worker rather than some special school for the purpose of accelerating the numbers in attendance therein.

That sufficient clerical help be provided to take care of the routine work and records in order that the principals of evening trade schools may devote practically their whole time to visiting classes in their charge and that instructors may devote their whole time to instruction.

That the Board of Education require the director of industrial education to formulate courses of instruction for the evening trade schools and in this connection to commend to his attention the material gathered in respect to the trades of printing, machine work, inside electrical work, and carpentry and joinery by this survey.

The committee records its conviction that the short unit course of instruction in evening schools has its special value for adult workers in the trades who have not the habit or inclination to attend school courses of any length and who would be drawn to the evening school only to obtain assistance for some direct and particular need which arises in their immediate practical experience. For such men and such needs, short unit courses of four to twelve weeks in length may be of service.

For the young men between 16 and 21 years of age, who form the large bulk of evening trade extension students, it is far better in the judgment of the committee to offer courses of a year, two years and even three years in length, composed of matter that relates directly to trade needs, and in which instruction the later stages is differentiated to the fullest extent. It would be a great mistake in the judgment of the committee to emphasize solely to these young men in the developing period of life, whose success depends to a large extent upon their equipment gained through outside study, the idea of the short unit course and to give prominence only to a plan for brief phases of instruction.

VOLUNTARY PART-TIME INDUSTRIAL CLASSES.

The committee recommends:

That the instruction in voluntary part-time industrial classes should consist for the most part of subjects such as drawing, mathematics, and science related to the industrial needs of the occupations in which the workers are employed, and in part of subjects which will contribute to the employees social and civic development.

That all part-time industrial classes wherever practicable should be organized as to trades and not as to time served in industry or educational qualifications or age of pupils. Because

of the inevitable variations in age and previous school experience, there should not be more than twenty students registered in a class at any one time. By limiting the number to this extent small group and individual instruction which is essential can be provided.

Part-time industrial classes cannot always be conducted in commercial establishments, but must be provided for in part at least in school buildings or rooms otherwise secured for the purpose.

That the policy of the Board of Education be to extend voluntary part-time industrial classes wherever favorable opportunities can be found.

In the judgment of the committee the development of the part-time classes in the absence of compulsory legislative enactment must be a matter of slow growth in our individualistic communities. If this work is to be extended, steps should be first taken in industries representing large numbers of young workers and where there exists great need of trade extension instruction. The consent of some sympathetically disposed employer for the beginning of part-time classes with his employees should be secured. After such a beginning, efforts should be made through employers' associations and labor organizations to secure the consent of all employers in the trade or industry in which the work has been started to release their employees for such instruction during a portion of the working day.

It is the judgment of the committee that the only competent solution of the problem of part-time vocational instruction appears to lie with the State Legislature,—that shall make compulsory the attendance in such classes of all male minors from 16 to 18 years of age who are legally employed, and that shall at the same time compel employers, under appropriate penalties, to grant opportunities to such minors to attend these classes during a portion of the working day.

CO-OPERATIVE CLASSES.

The committee recommends:

That the City continue to maintain co-operative industrial classes with certain modifications as noted below at least for a period of several years to come in order that the value of such work may be more definitely determined.

The committee makes this recommendation with the full realization that not many high school students can be counted upon to enter manual occupations in the industries. The ideas of the homes from which come the large body of high school students are directed distinctly away from such occupations for their sons and daughters and it is evident that the contribution of the high school to the field of industry must be found in supplying young men with well-trained minds who are fitted after a further period of practical experience to attain to positions of at least subordinate leadership. Such positions have been termed the non-

commissioned officers of industry and include draftsmen, inspectors, testers, designers, and in general all positions of the supervising and foreman type.

From this analysis, it is evident that the co-operative classes in the high schools cannot be expected to reach large numbers and the critical questions that ultimately must be faced is whether the return for such work justifies its expense to the city.

On the other hand, the committee is convinced that the co-operative industrial course should not be regarded as a college preparatory course, but as a course which has for its predominant purpose to train the student for advantageous entrance into specific industry.

That the industrial co-operative work should be organized as to trades and each trade should be centralized in one building or school. Such centralization of the work appears to be necessary to secure groups of sufficient size to allow the formation of classes of individuals with similar trade interests.

That the division of time for the co-operative industrial classes remain as at present—half-time in shop and half-time in school.

That co-operative industrial classes should not be organized unless there is a definite agreement with the employer specifying a program of shop experiences with the hours of labor and wages. This agreement should be signed by the school authorities, the parent representing the boy, and the employer. Without such an agreement, it seems impossible to serve adequately the needs of the state, the boy and the employer.

That co-operative industrial classes be limited in so far as practicable to those industries in which at least thirty students are available for a closely related trade group that can be supervised effectively by one co-ordinator.

That the co-ordinator be selected on the basis of the requirements of the particular trade for which the co-operative industrial class is to train. That is, the co-ordinator for a co-operative industrial class in machine shop work should be a man with a thorough understanding of the machine trade. This same principle should be applied to the selection of all other co-ordinators.

That each co-ordinator be at the same time the teacher of related drawing, mathematics, and science for a double platoon group in the school and the supervisor of the work of the students of this group in the commercial establishments. Such a plan would permit both the interests of economy and efficiency to be realized.

That the character of the instruction in drawing, mathe-

matics and science be such as to secure the greatest possible degree of relation to the trade or occupation in which the student is employed.

That in addition to the related work instruction be provided as far as practicable in those subjects which make for social and civic development.

That inasmuch as the co-operative industrial classes have many aspects in common with the part-time industrial classes, both types be placed in charge of a common assistant director responsible to the director of industrial education.

That the entrance requirements for the industrial co-operative classes be based upon age rather than the completion of the first year of the high school course, and boys should be allowed to enter such classes at the age of 16 years.

FURTHERANCE OF SURVEY.

For the comprehensive future development of a program of industrial education it is recommended that provision be made for the study of other important trades and industries, and for the further study, at appropriate intervals, of the trades included in this survey. It is the conviction of the committee that facilities should be placed at the disposal of the director of industrial education to conduct such studies.

It is also recommended that the Board of Education appoint advisory committees for all trades at present represented in the day vocational or evening trade schools upon the same basis as those already recommended by this committee.

The committee further recommends that the director of industrial education, in co-operation with the trade advisory committees, make every effort to develop trade agreements with employers associations and labor organizations in regard to the following matters:

1. Credit on apprenticeship time for the graduates of pre-employment schools.
2. Compulsory attendance of apprentices or young workers in part-time and evening classes.
3. The development of dull-season classes.

